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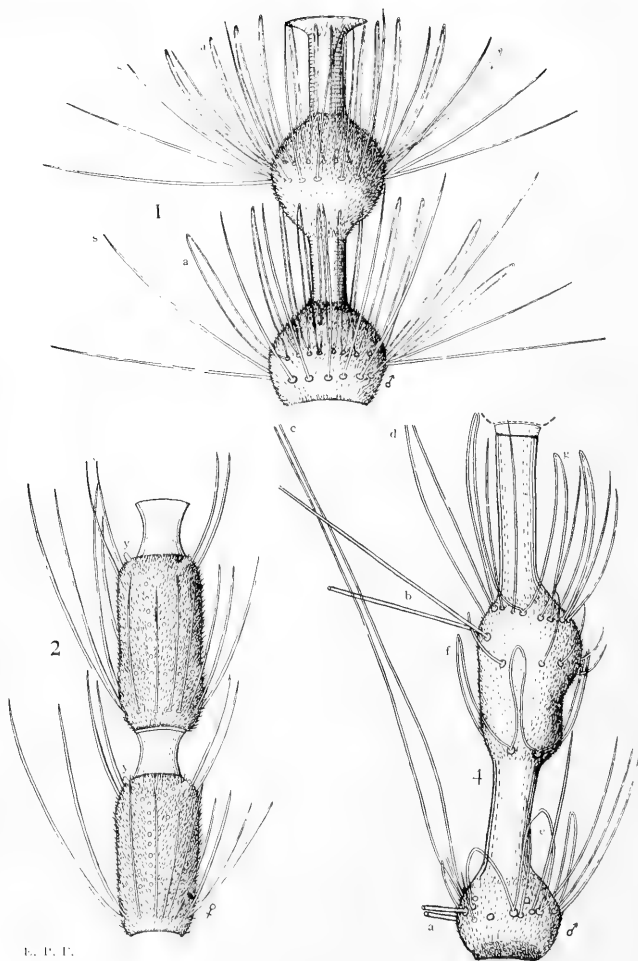
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E. P. F.

FELT.—ANTENNAL STRUCTURE OF DIPLOSIDS.

(Reproduced from the Eleventh Report of the N. Y. State Entomologist).

PSYCHE.

ANTENNAL STRUCTURE OF CERTAIN DIPLOSIDS.

BY E. PORTER FELT, ALBANY, NEW YORK.

The antenna of the male *Diplosis* is commonly said to possess twice the number of segments as does that of the female, excluding the two basal segments in each sex. At least such has been the accepted number until within a few years. According to Kieffer,* we owe the discovery that these segments in the male are compound and composed of two enlargements to Laboulbène, this, of course, doing away with the disparity in number of antennal segments between the sexes. In this same paper Kieffer describes some novel structures found upon the antennae of the male, which he terms *filets arqués* and which perhaps may be translated as *arched filaments*.

The arched filaments differ widely from ordinary setae, though they occur in whorls in the same manner. They arise from pits in the chitine in much the same way as do the setae, but, instead of remaining single and tapering to a point, they divide near the base into two equal branches which diverge to the middle of their length where they recurve, sharply as a rule, and turn to unite with the base of the adjoining filaments in the whorl (Fig.

1). Thus by means of the anastomosises these arched filaments, which from their designation one would expect to be free from each other, are in reality continuous and form a looped thread around the segment with anchoring branches at regular intervals. This structure is well brought out in a preparation of the male antennae of *Diplosis pyrivora* Riley. In this instance a number of the arched filaments accidentally became loosened from their attachments, but the anastomosises, where each arch is joined to the base of the next, remained unbroken and distinct. In this preparation the components of some of the arches may be seen diverging at very various angles—another strong fact in favor of their being no connecting membrane. The whorls of arched filaments occur on both enlargements of the antennal segments; in some species one on the basal and two on the medial enlargement. The ordinary setae occur in whorls in close proximity to the arched filaments, though usually nearer the base of the segment, unless there be two sets of filaments on one enlargement. The arched filaments have a uniform diameter throughout their course, though the anchoring branches are a little stouter; but there is no

* *Bull. stances Soc. entomol. Fr.*, 1895, p. CXCII.

indication of tapering as in the setae. The arched filaments are frequently as long as the setae, and in some instances longer; their length appears to be governed by the same conditions which determine that of the setae. In *Diplosis cucumeris* Lintn. the arched filaments on the dorsal side of the antennae are prolonged to nearly twice the length of a segment, while on the other sides they are less than half that length; the setae exhibit the same variation in length. In *Diplosis setigera* Lintn. and *D. pyrivora* there is no such dorsal elongation of the setae and the same is true of the arched filaments; they are about equally developed. The outlines described by the arched filaments are quite variable; they may be short with a broadly rounded apex or they may be excessively elongated and with a quite acute apex, or they may be more fanciful and describe a spatulate form. All of these variations may be seen in *D. cucumeris*.

Dr. Enzo Reuter in a paper on "Zwei neue Cecidomyinen"* questions the accuracy of the description of the arched filaments given by Kieffer and claims that they are but thickened borders of membranous lamellae or processes, and in his figures so represents them. If the figures are accurate, it is quite safe to conclude that Dr. Reuter was looking at very different structures from those described

by Kieffer; he has certainly failed to represent the peculiar origin of the arched filaments, though he has apparently figured the pits from which they arise. In a later paper M. Kieffer and M. Janet † have given in detail reasons why these structures cannot be regarded as the thickened borders of lamellae. They found it was impossible to demonstrate the presence of a membrane by histological methods; no trace of a connecting line between the bases of adjoining filaments could be seen; the arched filaments changed their form with great facility and in one instance a seta was observed to pass through a loop formed by a filament, which would be unlikely to occur if a membrane existed.

In the latter article referred to above, M. Janet has figured in detail the peculiar insertion of the arched filaments and he presents a theory of how they are developed. In short he suggests that they may have arisen as hypodermic lamellae and that the edges may have become thickened and chitinized while the inner membranous portion gradually shrank from the outlining edges and disappeared. He holds the opinion that the chitinization of the thickened edges and shrinking of the membrane at the apical portions of the lamellae would, in all probability, begin before they had attained their full length. This is perhaps as good a theory as can be advanced and agrees closely with the

* *Acta Soc. pro fauna et flora fennica*, xi, No. 8, 1895, pp. 11-12.

† *Bull. des séances Soc. entomol. Fr.*, 1896, pp. 37, 183-185.

facts, but it seems as though if true, there should be remnants of the membrane observable in some of the species. The insertion of the arched filaments being so similar to that of setae renders this theory not easy to accept, though no better one can be advanced. It is worthy of note in this connection that M. Kieffer has described some small hyaline lamellae on the female antennae of the genus *Monardia*.*

At this time it may also be well to call attention to certain structures in the female antennae of at least one species of *Diplosis* that appear to have been undescribed. On the enlarged portion of the segment there is, as in the male, a number of large setae and the whole of the enlargement is thickly clothed with a very short, minute pubescence. In the female of *Diplosis setigera* Lintn. this pubescence is absent along several longitudinal lines which extend from the basal third of the enlargement to near its apex; at the basal third these lines join a transverse line of similar character, and at the apex they are continued as diverging oblique lines over the edges of the segment. These lines are studded with large, transparent spots which in outline show themselves to be tubercles. They are disposed along these cleared lines at regular intervals, and some are found scattered irregularly beside the longitudinal lines. In spite of the few

irregular ones, the others give a marked appearance to the segment; it would seem as though these tubercles must be some special sense organ. Similar tubercles are found in *D. pyrivora*, but they are larger and exhibit but traces of the regularity of arrangement seen in *D. setigera*, while nothing of the kind occurs in *D. cucumeris*, at least with such striking distinctness, and it is doubtful if they are present. It may be that they are nothing more than the pellucid spots seen on other antennae which in *D. setigera* have reached an extraordinary degree of development and have been disposed with more than usual regularity.

The structures described above are illustrated in the figures of plate 1, which have been reproduced from the eleventh Report of the New York State Entomologist. Figure 1 represents the arrangement of setae (*s*), and arched filaments (*a*) in the male of *Diplosis setigera*. In figure 4, the same structures are shown on a segment of *Diplosis cucumeris*: *a*, *b* represent the basal portions of the much elongated dorsal setae of the two bulbs; *c*, *d*, the basal portions of the similarly elongated dorsal arched filaments; *e*, *f*, *g*, the shorter arched filaments of the three whorls. Figure 2 represents the peculiar arrangement of structures on the antennal segment of the female of *D. setigera*; two of which are shown in outline at *y*, *y*. There is no figure 3.

* *loc. cit.*, cccxix, 1895.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—I.

BY ALBERT P. MORSE, WELLESLEY, MASS.

This group of locusts has been ably monographed at a comparatively recent date by Saussure in his *Prodromus* and its sequel.* A key to the genera is given in each, the latter being the more complete.

He divides the entire group into three legions — *Oedipodites*, *Thrinclites*, *Eremobites* — according to the presence or absence of the apical spur on the external margin of the hind tibiae, and the position of the ocelli. All of our species belong to the first group, lacking the spine and having the ocelli placed near the eyes.

This group he divides, with one exception, into two series according to the width of the space between the lobes of the metasternum. To the first series, having this space relatively narrow, belong *Arphia*, *Chortophaga*, *Encoptolophus*, and three genera not represented in New England; to the other series, with the space relatively wide, belong all the remaining genera, about 60 in number, which are classified chiefly with reference to the form of the head and pronotum and texture of the tegmina. For further details, and for an explanation of the characters used in systematic treatment, nomenclature of venation, etc., the student should consult this admirable work.

* *Prodromus Oedipodiorum Insectorum ex ordine Orthopterorum*.—Mém. soc. phys. et d'hist. nat. d. Genève, xxviii, No. 9 (1884); *Addimenta ad Prodromum Oedipodiorum*, *ibid.* xxx, No. 1 (1885). In French and Latin.

In the following paper I have treated the genera in the order of the systematic arrangement as given by Saussure, but in the key to species I have made use of many characters of little or no systematic importance, preferring to use those which will enable the novice to determine specimens with the most ease and accuracy. The technical terms found in the key will be readily comprehended, in case of doubt, by a glance at the plate.

To the *Oedipodinae* belong all of the New England locusts having brightly-colored wings, a fact which, taken in connection with their moderate or large size, causes them to be rather conspicuous objects in flight. Not all of our species are thus decorated, but by far the larger number — twelve out of fifteen — the remaining three having them either pellucid or faintly clouded. It is worthy of notice in this connection that the latter occur in greater abundance of individuals than their more conspicuous relatives, and that they frequent fields with an abundance of grass rather than places where the herbage is sparse, which seem more attractive to many of the others. They are also much less shy and active than the bright-winged ones, which are the warriest and most difficult to capture of all our locusts.

In the brightly-colored wings the color may be mainly black, yellow or

red, yellow tints predominating. It is in no sense protective and bears no relation to the environment, but is probably of value in the mating of the sexes. It may vary much in the same species, but the sexes are similar. This variation is partly due, no doubt, to age; for newly matured individuals of a yellow-winged species have the disk very pale, even dull white in color. In some species (e. g., *Psinidia fenestralis*) individuals show all shades of color from dull white through yellow and orange to vermilion red. This variation may be found in the same locality or the orange and red examples may be lacking. In *Hippiscus tuberculatus*, whose wings are normally red, yellow-winged examples are very rare.

Prof. Bruner has sought to connect this difference of wing-color with the relative humidity of different localities, stating that the red coloration seemed to be most prevalent in moist regions (*Science*, 1893, p. 133). This, however, has been questioned (*ibid.*, p. 245). In New England I have found red-winged examples of *Ps. fenestralis* most common in the warmest parts of the district and suspect that the greater intensity of coloration is due in part to higher temperature. This is apparently true also of *Arphia xanthoptera* which is entirely yellow-winged here but in the Central States is frequently orange-winged. The yellow-winged examples of *H. tuberculatus* above referred to are probably to be regarded as cases of reversion, most species of the genus being yellow-winged.

The Oedipodinae are noticeable not

only from their size and gaily colored wings but quite as much from the rattling noise which the males of many species produce in flight. The female also, in some cases, makes it in less degree. Stridulation is produced not only at this time, however, but also when at rest, as in the Tryxalinae, by rubbing the hind thighs against the wing-covers, the intercalary vein of which is in most cases toothed or roughened. This subject I have treated more fully in a recent paper (*Journ. N. Y. ent. soc.*, iv, 16-20, Mar. 1896).

Owing, doubtless, to the conspicuous character of the locusts of this group the majority of our species were first described at an early date from material received from this country by European entomologists. Consequently I have been unable to examine the types, and have used the current names (based upon Scudder's determinations) except in the genus *Spharagemon*, in which I have followed my recent Revision (*Psyche*, 1895, Oct.).

The works cited under bibliography, unless otherwise noted, are the same as in Parts I and II* with the addition of Saussure's *Prodromus*.

Owing to their alertness most of the locusts of this group can be secured only by marking down (*i. e.*, taking note of the exact spot where they alight), approaching carefully, and capturing them by a rapid sweep of the net while they are on the ground or

* These are in brief: Beutenmüller,—*Orth. N. Y.*; Comstock,—*Introd.*; Fernald,—*Orth. N. E.*; Morse,—*List*; Scudder,—*Materials*; Smith,—*Orth. Me.*, *Orth. Conn.*; Thomas,—*Synop. Acrid. N. A.*

when they rise. *Ch. viridifasciata*, *E. so. didus*, and *C. pellucida* are exceptions to this and may generally be readily obtained by the usual method of sweeping, only an occasional specimen of the other species being secured in this manner. The larger part of the specimens in my collection, about 2000 in number, have been taken personally, and I have met in the field all of the species treated with the exception of *Hippiscus rugosus*.

Correlated with their active aerial habits is the uniformly well-developed condition of the flight-organs; not a solitary example with abortive wings is known to me of the New England species of this subfamily,—a peculiarity in which it presents a marked contrast to the others. Consequently, as being of but relatively slight interest I have omitted from the measurements here given the extent of the tegmina beyond the hind femora.

DESCRIPTION OF THE BOT-FLY OF THE COTTON-TAIL RABBIT IN NEW MEXICO, CUTEREBRA LEPUSCULI N. SP.

BY C. H. TYLER TOWNSEND. LAS CRUCES, N. M.

Upon examination of Mr. E. E. Austen's two papers on *Cuterebra*, in the May and August, 1895, numbers of the *Annals and Magazine of Natural History*, and a re-examination of my material from cotton-tails and jack-rabbits, two points become very evident. One is that the species, which I have so far referred to *C. fontinella* Clark, is a new species; and the other is that the bots taken from jack-rabbits, which I referred to *Dermatobia*, belong to the new genus *Bogeria* of Austen. For my previous papers, the reader is referred to *Psyche*, vol 6, pp. 298-300; and *Insect Life*, vol. 5, pp. 317-320. My certainty in determining my specimens as *C. fontinella* rested on the general agreement of Clark's description, the similar host habit, the not too greatly removed locality of Clark's species, and the fact that but little reliance can be placed in many cases

on the measurements of the old authors when given in lines. But since Mr. Austen, with the necessary material and plates at his command, has determined *C. fontinella* Clark beyond doubt to be a much smaller and very different species from my own, it becomes evident that my conclusion was wrong. The following description is that drawn from my two bred specimens described in *Insect Life*. These specimens are now in the collection of the University of Kansas.

Cuterebra lepusculi n. sp.

Cut. fontinella Towns. *Ins. Life*, v, 319 (nec. Clark and Austen.)

♀. Length of body, 20.5 mm. to 21 mm.; width of abdomen, 9 mm. to 9.5 mm.; width of thorax, 9 mm. or a little more; width of head, 8 mm. to 8.25 mm.; length of wing, 16 mm. to 16.25 mm. Front about seven-sixteenths width of head at vertex, grayish-black, scantily grayish-hairy, with two

whitish triangular markings on anterior eye-margin, the lower one elongate and extended in a line nearly to base of antennae; these leave two larger transverse glabrous shining black areas. Antennae and arista grayish. Facial depression silvery, base with blackish lower border, the black of the latter descending in one specimen in a median line on the closely approximated and soldered facial ridges. Whole of sides of face, cheeks, oral region, in fact all of head below antennae, covered with a yellowish-white bloom and clothed with whitish hairs, the oral region especially hairy; two small black spots on cheeks, one next lower margin of eye, and the other well removed therefrom toward oral slit. Dorsum of thorax and scutellum grayish-black, short and finely black-hairy. Whole under surface of thorax, with sides of thorax, both above, below, and anterior to wing bases, and continued completely around edge of scutellum, thickly yellowish-white-hairy; three black spots on side of thorax, the upper one hairy. Abdomen black, with a bluish or purplish luster, rather thickly clothed with short and fine black hairs; inferior lateral edges with regions of grayish bloom containing blackish spots, in one specimen continued faintly on sides of abdomen in places. Restoring the color of the abdomen with chloroform shows this grayish bloom, with the circular black spots, to extend in both specimens upon sides of abdomen and dorsum of last two segments, and even in places on dorsum of second segment. Legs blackish, inferior surface with more or less of a grayish bloom, especially on femora and tibiae. Wings, tegulae, and alulets fuscous or smoky, the alulets very prominently approximated to sides of scutellum when wings are closed over abdomen.

Described from two specimens bred from larvae taken, Oct. 15, from *Lepus artemisia* Bach., near Doña Ana, New Mexico, the adults having appeared about the first of May following.

My description of the larva in *Psyche* should be slightly changed. The so-called "short horny spurs" are better characterized as "spur-like plates," as I later described them in *Ins. Life* (l. c., 320). Mr. Austen is quite correct in calling them "imbricated scales." The length of the fully grown larva is greater than given in *Psyche*. Alive they measure as long as 30 mm., by 14 mm. wide; dead and contracted in alcohol, they measure as long as 26 mm., by 16½ mm. wide.

The larva I described in *Psyche* as a *Dermatobia* is doubtless to be referred to *Bogeria*. The spines are arranged in zones, as described by Austen, though my specimens are little more than half grown and show the spines much less conspicuously. They are directed backward, are hardly curved, and are confined to a little less than anterior half of segment. I can see no smaller spines on posterior margin of segment, but the small bluntly-conical tubercles of rest of surface show indistinctly in places. The latter are what caused me to fall into the error of describing the segments as sparsely covered with short spines, since I mistook the indistinct tubercles for very small spines just appearing. This mistake is easily made in young or half grown larvae.

Mr. Austen's species, *Bogeria princeps*, I have little doubt infests the jack-rabbit (*Lepus callotis* Wagler) in Sonora. It is very likely the same as the New Mexico species.

SOME FACTS IN THE LIFE HISTORY OF HYPOPTA BERTHOLDI GROTE.

BY J. J. RIVERS, SANTA MONICA, CAL.

The color of the larva when about half an inch long, is yellowish white; but as it increases in size the tone of color becomes warmer until at its full growth it assumes a beautiful carnelian red heightened by an enamelled surface.

The exact larval changes are not easily observed, because this, like other species of endophagous larvae, will not yield to the prying methods of the lepidopterist; a second disturbance ends the life of the larva. *Cossus ligniperda* of Europe will endure barbarous treatment, but this Californian prefers death rather than submit to molestation. Its food consists of the fibre of the main stem and larger roots of the lilac flowered lupin which grows on the hills of the Coast Range. The duration of life in the larval state is undetermined, but the occurrence of larvae of several ages in the same shrub would imply that its period of growth must extend beyond one year.

The fully grown larva leaves the food plant and wanders a long distance before burrowing. It descends into the ground a foot or more where it forms a cocoon by weaving together granules of sand or any other material within reach and pupates and reaches maturity in five or six weeks.

The pupa may be said to be active, as it appears at the surface of the ground, head projecting, just before the moth emerges. The moth does not

entirely leave the pupa case and climb some friendly twig to give support, while the wings are unfolding, but the anal portion of the abdomen is still retained in the gaping pupa case. While the wings are growing the body of the moth is nearly vertical, the pupa case being its base. Then the wings unfold outwards and upwards back to back, describing a high angle. When the growth is completed and the wings are hardened, they drop deflexed, the moth withdraws entirely from the pupa case and crawls a short distance upon the surface of the ground where it remains until the shadow of the descending sun reminds it of the approach of the period of its activity.

DESCRIPTION OF THE LARVA OF HYPOPTA BERTHOLDI.

MR. J. J. RIVERS has sent me some examples of the larva of this cossid, the first larva of this genus found in America. Head small, partly retracted; clypeus small, tapering above, corrugated as are also the lower sides of the lobes; jaws and labrum large; antennae rather short; red. the most of the exposed corrugated part dark brown. Body flattened, especially ventrally, smooth, shining red. Each dorsal segment has a single transverse groove, laterally two longitudinal ridges. Thoracic feet small, pointed; abdominal ones very short, practically absent, the crotchets distinct, arranged in two long parallel transverse rows. Joint 13 is small and in place of feet there is a black hardened area. Above on the suranal flap a large black,

recurved, horn-like spine, stout and thick. Cervical shield reduced to a small, scarcely cornified, concolorous area. Spiracles circular, rather large. Setae very fine and obscure, the tubercles reduced to obliteration; i and ii nearly in line, iii above the spiracle, three or four smaller secondary setae scattered over the lateral area; iv and v on the upper subventral ridge in line, rather remote; vi on the lower ridge; vii of two or three very small setae close to the crotchets of the foot. Length of larva about 35 mm.

Harrison G. Dyar.

NOTE ON EGGS OF STAGMOMANTIS CAROLINA.

THE eggs of this insect are enclosed in cells in the ootheca, the walls of which consist of a tough, almost horny, secretion. To reach the eggs by mechanical means, one has to tear these walls down, and when these are removed there still remains, outside the egg-membrane itself, which is exceedingly delicate, transparent and glistening, a partially transparent membrane of great tenuity like an investing tunic of desiccated froth.

The ootheca, according to Glover, are deposited on branches of trees in the autumn. They hatch in May of the following year, and leave a skin protruding from the egg, half as long as the hatched larva; each cell of the ootheca is hexagonal in transverse section and has an elastic neck at summit. A large mass sent me by the late B. D. Walsh measured 23 mm. in length, 10 mm. in breadth, and 6 mm. in height; there is an empty chamber on each side and an empty space at the summit, apparently for the better protection of the eggs. Cut across the middle, it was seen that there were nine lines of eggs, the central one upright, those at the sides inclined toward it; the outside row contained 20 eggs, so that there were probably 150 eggs in the whole mass.

The eggs are about 3.25 mm. long and 0.75 mm. in diameter, and in midwinter

were partially developed, just about as far advanced as was observed for the same season in *Chloactis conspersa*, or perhaps slightly less advanced. In this stage the eyes of the embryo are distinctly marked by discolored spots and the facets may be observed, though they are very indistinctly margined; no sharp angles can be seen, the facets being as much circular as polygonal; at the same time, the limits of the eye are vague, the facets merging imperceptibly into the other cellular matter; this eye spot lies not far from the middle of the egg. There seems to be little further advance until shortly before hatching.

Samuel H. Scudder.

LEUCANIA UNIPUNCTA.

EARLY last summer there appeared at Little Boar's Head, New Hampshire, swarms of moths, which, one night, covered the ceiling of the little building used as a post office, and in several instances so covered the walls and ceilings of sleeping-rooms in some of the houses, that the rooms could not be occupied until the moths had been cleared out. In at least one case the rooms had to be fumigated with sulphur, and the dead moths swept up and carried away.

Some fishermen told of a great cloud of the moths over their boat out on the sea.

No entomologist being at hand, specimens were sent to Cambridge, and word came back — "Look out for next year! They are army-worm moths."

In most cases no one could tell how the moths entered the houses, for doors and windows were well fitted with wire screens.

In Brookline, Mass. the larvae have been very abundant this autumn, not marching, but appearing at night, cutworm fashion.

Blue jays, golden-winged woodpeckers, and "chickadees" have found them out, and may be seen searching the ground for them, — the first time I have seen chickadees on the ground.

Caroline G. Soule.

Nov. 17, 1896.

PROCEEDINGS OF THE CLUB.

8 May, 1896. The 192d meeting was held at 156 Brattle St., Mr. J. W. Folsom in the chair.

Dr. Seitaro Goto was elected a member.

Mr. S. H. Scudder stated that on April 13 he had seen a pair of *Euvanessa antiopa* in coitu, and had kept the female alive until May 8 when it died. Ample opportunity had been given it for laying, without result, although examination after death showed the eggs to be well-developed.

Mr. J. W. Folsom said that recently, while collecting at Waverly, Mass., he took two aquatic species of *Smynthurus*. He stated that he had seen them apparently in coitu; his observations confirmed Reuter's description of their peculiar manner of copulation.

Mr. Scudder showed his collection of Mantidae and remarked briefly upon some of our species.

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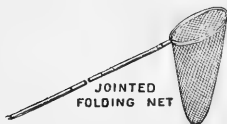
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PSYCHE.

IMAGINAL DISCS IN INSECTS.

BY HENRY S. PRATT, PH. D., HAVERFORD COLLEGE, PA.

[Annual address of the retiring president of the Cambridge Entomological Club, 8 January, 1907].

Among insects which have a complete metamorphosis the organization of the larva is in general similar to that of the adult or imago, but the larva always lacks certain organs which the imago possesses. The larval beetle or butterfly lacks wings, the larval bee has neither wings nor legs which is also true of the larval gnat, while the larval fly has neither legs, wings nor head; and in each case the imago possesses these organs. As we ascend the scale of development from the less highly to the more highly specialized insects having complete metamorphosis, we find a constantly increasing sum of differences between the larval and the imaginal forms, and a correspondingly increasing number of organs which are possessed by the imago and not by the larva. This drawing apart is due, on the one hand, to the higher specialization of the imago and its consequent further departure from the ancestral stage of its ontogeny represented or suggested by the larva, but also largely to the retrogressive development of the larva itself. In the highest insects, where the imago is a highly specialized animal capable of living only in a certain restricted environment, the larva is perhaps as

highly specialized as is the imago: its environment is as sharply restricted and its structure departs as far from the phyletic type or stage it represents as is the case with the imago.

In the coleoptera, to consider first one of the less highly specialized groups of holometabolic insects, the environments of the larva and of the imago are usually quite similar, or perhaps they are exactly the same; the organs of the two forms are correspondingly similar, and the transformations which must be accomplished on the body of the larva to produce the imago are but slight. The imago differs from the larva principally in that it has acquired wings, elytra, compound eyes, and external reproductive organs, but all the larval organs with the exception of the midgut become imaginal ones without great change. The midgut in all holometabolic insects undergoes a complete transformation during the metamorphosis.*

In the lepidoptera, to come to a somewhat more highly specialized group, the larval and imaginal environments are apparently widely different

* Kowalevsky, A. Beiträge zur Kenntnis der nachembryonalen Entwicklung der Musciden. Zeit. f. wiss. Zool. 45: 3, 1887. p. 565.

from each other. But, after all, both larva and imago live on vegetable food, and more than this, in the higher members of the group at least, on very nearly the same kind of vegetable food, the leaves and flowers of phanerogamous plants. The larva eats and lives among the green leaves, while the imago finds its nourishment in the flowers which are modified leaves. So that we shall not be surprised if we find that the transformations which result in the production of the butterfly from the caterpillar are not as great as the apparently great difference between the two forms might suggest. As is the case with the coleoptera, the imago acquires wings, compound eyes, and external reproductive organs, and all the larval organs with the exception of the midgut pass directly into the imaginal organs, although some of them are highly modified in the process; but there is no complete making over, no general histolysis.

In the hymenoptera the larva and imago live in general on the same kind of food. But the conditions of colonial and family life which prevail among the higher members of the order have resulted in a marked retrogressive development on the part of the larva, so that it is very different structurally, from the imago. Not having to find its own food, to protect itself, or to escape from enemies, it has lost its extremities. In the nematoceran diptera other conditions have produced similar results, and we also find apodous larvae. The transformations, now, which the pupae of these

insects must undergo to become imagines are much greater than is the case in the coleoptera or lepidoptera. Not only must wings be acquired during the metamorphosis but legs as well, and the larval organs require a much greater modification before they can serve as imaginal organs. But yet no complete making over, no general histolysis* takes place.

When we come to the brachycera diptera, the most highly specialized insects in my opinion, we find the greatest structural differences between the larva and the imago to be met among insects. The environment of the larva is as a rule totally different from that of the imago, and the larval structure correspondingly different from the imaginal. The larva, too, has undergone an extensive retrogressive development. In the case of the nematocera, as I have just said, the larva is without legs, but in the brachycera the retrogression has gone much further and the larva has neither legs nor head. There are also great internal differences. In the metamorphosis, consequently, a very different animal must come out of the puparium than went into it. The imago must acquire not only external reproductive organs, compound eyes, wings, legs, and a head, none of which the larva possessed, but also internal organs very different from those of the larva. A complete making over accompanied by general histolysis is the result.

* Ganin, M. The post embryonic development of insects. (Russian) Warsaw 1876. Reviewed in Zeit. f. Wiss. Zool. 25Bd. 1877; p. 386.

A dissection of an old larva or a young pupa of either of the insect orders above mentioned would show that these new organs which the insect is to acquire during its metamorphosis are really already present, not as fully formed organs, however, but in the form of rudiments oranlagen. In the body cavity of the caterpillar, for instance, buried beneath the dorsal meso- and metathoracic integument are two pairs of small disc-like islands of cells. These remain unfunctional and inactive during the caterpillar's lifetime although growing constantly, but during its metamorphosis they develop into the two pairs of wings of the butterfly.* Similar cell-islands are present in the larval coleopteron.† The larval hymenopteron also possesses them †; while beneath its ventral thoracic integument are three other pairs of cell-islands whose fate it is to furnish the imaginal legs. In the nematocera, also, ventral and dorsal pairs of cell-islands are present in the larva, as the observations of Weismann on *Corethra* ‡ first showed. This classic investigation demonstrated the presence of three dorsal pairs of cell-islands as well as three ventral pairs. They are situated in the body cavity of the larva just beneath the integument, a dorsal and a ventral pair in the prothorax, destined to form the pupal spiracles and the

imaginal prothoracic legs, respectively; a dorsal and a ventral pair in the mesothorax, destined to form the wings and the mesothoracic legs; and a dorsal and a ventral pair in the metathorax, destined to form the balancers and the metathoracic legs.

In the brachycera Weismann § was again the first to prove the existence of these cell-islands. It was in 1864 that he published in his account of the post-embryonic development of the muscids the first correct and extended observations on these peculiar cell-islands in any insect. He called them *imaginal discs*. He showed that in *Musca* six pairs are present in the larval thorax, not near the surface as in *Corethra*, but in the center of the larva, and that their fate is exactly the same as in *Corethra*. In addition to these thoracic imaginal discs he described two large cephalic discs situated in the forward portion of the thorax and connected with the larval pharynx, the fate of which is to form the imaginal head. Weismann also showed ¶ that but a small portion of the larval body passes directly into the imaginal body, but that most of it undergoes disintegration so that the different tissues entirely lose their identity, after which the imaginal body is built up from the imaginal discs. To this process, the entire significance of which was not, however, understood until later, he gave the name *histolysis*.

*Swammerdam. *Bibel der Natur*. Leipzig 1752, p. 3. *Pan-critius*. Beitr. z. Kennt. d. Flügelentw. b. d. Insecten. Königsberg, 1834.

† Ganin. l. c. p. 387.

‡ Weismann. *Die Metamorphose von Corethra plumicornis*. Zeit. f. wiss. Zool. 16 Bd. 1866. p. 45.

§ Weismann, A. *Die nachembryonale Entwick. d. Musciden nach Beob. an Musca vom. u. Sarcophoga carnaria*. Zeit. f. wiss. Zool. 14 Bd. Heft 3. 1864. p. 221.

¶ l. c. p. 322 and 326.

These observations of Weismann opened a new field of investigation in the development of insects. This has been entered by several eminent investigators of whom Ganin, Künckel d'Herculais, Viallanes, Kowalevsky, and Van Rees have been the most successful. Ganin * in 1876 demonstrated the presence of many other imaginal discs than those which Weismann described. Weismann supposed that the hypodermis of the larval abdomen went directly with some modifications to form that of the imago. Ganin showed, now, that in the hypodermis of each of the eight abdominal segments are four cell-islands, two dorsal and two ventral, which resemble in every respect the tissue of the imaginal discs; that they are in fact imaginal discs and are destined to form the starting points for the growth of the imaginal abdominal hypodermis. Ganin also discovered similar discs in the epithelium of the midgut whose fate it is to form, in the same way, the imaginal midgut, and also the important fact that each imaginal disc in the larva is made up of two kinds of embryonic tissue, ectoderm and mesoderm or mesenchym. In 1875 Künckel d'Herculais † found in the last abdominal segment two pairs of imaginal discs of the external genital organs. In 1883 Metschnikoff ‡

published the first of his epoch-making observations on the destruction of tissues in certain invertebrates by leucocytes or as he called them phagocytes. He discussed Ganin's paper and especially his statement that during the histolysis of the pupal muscid the larval organs are destroyed by amoeboid mesoderm cells. These cells he suggests are none other than phagocytes. In 1884 Van Rees § and in 1885 Kowalevsky || proved the correctness of this position; they showed that the process of histolysis is the tearing down and digestion of the functional larval tissues by phagocytes and the building up of imaginal tissues from imaginal discs.

In 1888 Van Rees ¶ published his extensive paper on the post-embryonic development of muscids, and completed our knowledge of this phenomenon. He showed that when the muscidian larva has entered upon the pupal stage, histolysis is inaugurated by the destruction of the larval muscles, they becoming unfunctional directly after pupation and a natural prey to the phagocytes. Soon the thoracic hypodermis and the inner organs are attacked, and at the same time the imaginal discs begin to grow and widen out to supply the place of the tissues which are being destroyed. The continuity of the hypodermis and

* l. c. p. 386.

† Künckel d'Herculais. Recherches sur l'organisation et le développement des Volucelles. Paris, 1875, p. 149.

‡ Metschnikoff. Untersuchung über intracelluläre Verdauung bei Wirbellosen. Arb. a. d. Zool. Inst. z. Wien. 5 Bd. 1883, p. 141.

§ Van Rees. Over intra-cellulaire spijsvertering en over de beteekenis der witte bloedichampjes. Maandblad voor Naturwetenschappen. Jaarg. 11, 1884.

|| Kowalevsky. Beiträge z. nachembryonale Entwicklung d. Musciden. Zool. Anz. 8 Bd. 1885, p. 98.

¶ Van Rees. Beiträge z. Kenntniss d. inneren Metamorphose v. Musca vomitoria. Zool. Jahrb. Abth. f. Anat. u. Ontog. 3. Bd. 1888, p. 1.

of most of the internal organs is thus not at any time broken. As these processes go on, the two large head imaginal discs, which form two irregularly shaped sacks extending as diverticula from the dorsal wall of the pharynx back to the brain, begin to pass forward dragging the brain with them. Their anterior ends bend and pass ventrad embracing the pharynx between them. At the same time their communications with the pharynx enlarge and their lumena fuse more completely with the pharyngeal lumen. These communications now continue to enlarge; they fuse into one single median opening which, ever increasing in size, travels from the anterior end of the pharynx posteriad, obliterating the dorsal pharyngeal wall in its course. Finally the lumena of the discs and that of the pharynx become completely merged and form together a single continuous space, and the walls of the discs and of the pharynx form a single continuous vesicle. This is the head-vesicle of Weismann * and Van Rees † which is destined to become the imaginal head. On its anterior ventral surface epithelial thickenings appear which are destined to form the imaginal antennae and mouth parts, while at its posterior end are thickenings which are to become the compound eyes and which are still in contact with the brain. The head-vesicle remains buried within the pupal thorax until near the end of the pupal

period when it evaginates and forms the imaginal head. This evagination has been observed by Weismann ‡ to be the consequence of the pressure of blood which at the right moment rushes from the abdomen into the thorax and pushes the head-vesicle forward.

The metamorphosis of the thorax goes on simultaneously with the formation of the head-vesicle. In proportion as the larval hypodermis disappears under the attacks of the phagocytes, as I have already mentioned, the edges of the imaginal discs grow and take its place, forming the imaginal hypodermis. As we have seen, there are six pairs of these discs, three dorsal and three ventral, and they are in the center of the larva. Each disc is, however, connected with that portion of the hypodermis of the segment to which it genetically belongs and where it is destined to appear as an extremity, by a very fine, hollow chord. This chord, now, begins to shorten and its lumen to enlarge. The disc is thus brought nearer the surface and, as it advances, it increases in size. The lumen of the chord then opens through the hypodermis to the outside, and finally becomes so wide and the chord itself so short that the disc is brought through the hypodermis to the outside. The hollow chord has of course been obliterated by this process and the edges of the proximal end of the disc brought into direct connection with the hypodermis. The disc has by this time assumed its

* l. c. p. 258.

† l. c. p. 44.

‡ l. c. p. 250.

position as an extremity. It is an appendage of the body wall; it has become irregularly cylindrical in shape and possesses a number of constrictions and folds, which in the case of the ventral discs are equivalent to the joints of the future leg. The proximal edges of the discs, those in contact with the larval hypodermis, grow and extend themselves and take the place of larval hypodermis in proportion as this is destroyed by phagocytes.

The metamorphosis of the abdomen is retarded and does not begin until that of the head and thorax is well advanced. Then in each abdominal segment the two ventral and four dorsal discs (Van Rees found two additional dorsal discs in each segment) begin to grow and take the place of the disappearing larval hypodermis.

Kowalevsky * discovered that the discs of the last segment do not take part in the formation of hypodermis, but of the endgut with the rectal glands, and that they are situated in the vicinity of the larval anus. The metamorphosis of the larval internal organs was correctly reported first by Kowalevsky † in the year preceding the publication of Van Rees' paper. All of these organs are destroyed by phagocytes except the central nervous system, the heart, the reproductive organs, and three pairs of thoracic muscles. These with the exception of the reproductive organs remain

active, functional organs during the pupal period and are not attacked by phagocytes, but pass directly into the imago without great change and become imaginal organs. The organs destroyed are reconstructed from imaginal discs in a way similar to that already described.

The only paper dealing with imaginal discs which has appeared since Van Rees' is one of my own published in 1893.‡ It contains a description of the larva of *Melophagus ovinus*, a pupiparous dipter.

The pupipars are cyclorhaphic brachycera and very closely allied to the muscids, so that we may expect to find the same imaginal discs in their larvae as in the muscids. And we do, in fact, find in general similar conditions, but there are several interesting differences. The larva is apodous and acephalous like the muscidian, but in many respects it is much less highly specialized; it seems, in fact, as if it might represent the ancestral stage in dipteran phylogeny at which the muscids are beginning to draw away from their relatives, to occupy a position between *Corethra* and *Musca*. In the position of the thoracic discs, for instance, it closely resembles *Corethra*. We find these discs just beneath the integument in two very regular rows and not in the center of the larva as in *Musca*. The accompanying wood cut represents dorsal and ventral frontal

* Kowalevsky. Beiträge z. Kenntniss d. nachembryonalen Entwicklung d. Musciden. I Theil. Zeit. f. Wiss. Zool. 45 Bd. 1887, p. 557.

† l. c. p. 542

‡ Pratt. Beiträge z. Kenntnis d. Pupiparen. Die Larve von *Melophagus ovinus*. Archiv f. Naturgeschichte. Bd. 59, 1893, p. 151.

sections through the anterior end of an old larva showing the position of the thoracic discs. The dorsal prothoracic

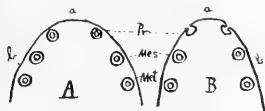


Fig. 1. *A*, ventral frontal section; *B*, dorsal frontal section; *a*, anterior-pole; *Pr*, *Mes* and *Met*, pro-, meso-, and metathoracic imaginal discs; *b*, body wall.

pair arise during the larval period and are not embryonic organs as are all the others (Van Rees noticed the same fact about the corresponding muscidian discs). They are invaginations of the larval hypodermis and have external openings which do not close, and their inner surface is lined with a delicate cuticula which is a continuation of the external cuticula of the larva. These discs are rudimentary organs and do not develop into any pupal or imaginal organs. In structure the meso- and metathoracic discs stand exactly midway between the same discs in *Corethra* and in *Musca*. In *Corethra** all the thoracic discs are of larval origin, aris-

ing as they do after the last larval moult, and each one is a double fold of the hypodermis, of which it remains a part as Fig. 2 shows. In *Melophagus*, on the other hand, each of these discs arises in the embryo, as is also the case in *Musca*; it is also a double fold of the hypodermis but becomes constricted off from it as is shown in Fig. 3. Van Rees† has called that portion of the invaginated hypodermis which encloses the disc proper, the parapodial membrane (*P*, Figs. 3 and 4), and the space it encloses, the parapodial space. In *Musca*‡, now, the disc not only becomes constricted off from the hypodermis but suffers removal to the center of the larva as is shown diagrammatically in Fig. 4, and the parapodial membrane lengthens to form the hollow chord which connects it

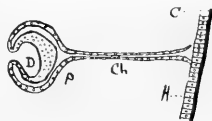


Fig. 4. *D*, imaginal disc in *Musca*; *H*, hypodermis; *C*, cuticula; *P*, parapodial membrane; *Ch*, chord.

with its old position at the hypodermis. The fate of the thoracic discs in *Melophagus* is exactly the same as in *Corethra* or in *Musca*.

In the cephalic discs, now, we find the conditions similar to those in *Musca*, but even more complicated. Instead of a single pair of head-discs we find two pairs, one dorsal and one ventral. The dorsal pair corresponds to the muscidian

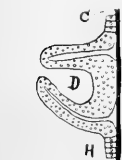


Fig. 2. *D*, imaginal disc in *Corethra*; *H*, hypodermis; *C*, cuticula.

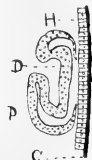


Fig. 3. *D*, imaginal disc in *Melophagus*; *H*, hypodermis; *C*, cuticula; *P*, parapodial membrane.

†l. c. p. 24.

‡Van Rees. l. c. p. 23.

* Weismann, *Corethra*. l. c. p. 78

head-discs in every respect; they are destined to form the dorsal and lateral portions of the imaginal head together with the compound eyes. The ventral head-discs have no counterpart in *Musca*. In the embryo, as we shall see in a moment, they appear as a single median thickening, but in the young larva they have become paired diverticula of the ventral pharyngeal wall; and at the bottom of each diverticulum there arises a projection. These diverticula soon fuse in the median line and the wall between them gradually disappears. In the old larva, consequently, the ventral discs appear as a single ventral diverticulum of the pharynx at the bottom of which a pair of long projections extend toward the wide opening. The fate of these discs is to form the ventral portion of the head, the paired projections forming the anlage of the proboscis.

The formation of the head-vesicle proceeds in a way similar to that in *Musca*. The ventral disc fuses early at its lateral edges with the dorsal pair. The communications between both ventral and dorsal discs and the pharynx rapidly widen (in the old larva they have already become very large), and soon the discs and pharynx form together a single vesicle, which is the head-vesicle.

The imaginal discs of the abdomen in *Melophagus* are exactly the same as the corresponding ones in *Musca*.

I shall now speak of the origin and early development of imaginal discs. But little has been published on this subject and nothing, so far as I know, on the origin of muscidian discs.

Weismann* showed in 1866 that in *Corethra*, that is, in the nematocera, the thoracic discs arise as ectodermic infoldings after the last larval moult, and just before pupation (Fig. 2). This is rather surprising, as we should expect these discs, as they represent extremities, to appear in an early embryonic period when the extremities usually arise in insects. In *Musca*, Weismann† did in fact find that the imaginal discs arise in the embryo, but their genesis was not observed by him, and, as he found them invariably attached to a trachea or a nerve, he made the mistake of supposing that they take their origin in the epithelial coverings of these organs. This method of growth was, however, early discredited by Künckel d'Herculais‡ who, in 1875, found the chord connecting the thoracic discs with the hypodermis, and rightly concluded that they have an ectodermic origin. Balfour§ also, in his text book, declared that the thoracic and cephalic discs must be derivatives of the ectoderm in *Musca* as they had been proved to be in *Corethra*. Dewitz|| in 1878 confirmed d'Herculais' observation of the chord connecting the disc with the hypodermis, and Van Rees some years later in his paper already quoted¶ showed that this chord is

*Weismann. Die Metamorphose v. *Corethra* etc. p. 78.

†Weismann. Die nachembry. Entw. v. d. Musciden, etc., p. 223.

‡l. c. p. 146.

§Balfour. Comparative Embryology, vol. 1, p. 423.

||Dewitz. Beiträge z. Kenntnis d. postembry. Gliedmassen b. d. Insecten. Zeit. f. wiss. Zool. Bd. 30. Sup. p. 95.

¶l. c. p. 25

hollow, that its lumen is a continuation of the parapodial space, as shown in Fig. 4, and that both lumen and parapodial cavity are lined by a fine cuticula. He asserts that this discovery is anatomical proof that the chord, the parapodial membrane, and the disc itself are all parts of a single invagination of the embryonic ectoderm. Graber,* however, in 1889, supported by certain observations on *Calliphora*, a muscid, asserts that the beginnings of both the thoracic and cephalic imaginal discs are not ectodermic invaginations, but ectodermic thickenings towards the inside, followed by delaminations.

There exists in fact at the present time no embryological evidence on the origin and first stages of development of the thoracic and cephalic imaginal discs in the brachyceran diptera, although all the later writers except Graber, supported by the fact of their undoubted ectodermic origin in the larva of *Corethra*, and also by the anatomical evidence adduced by Van Rees, are of the opinion that they arise as invaginations of the embryonic ectoderm.

I have been for some time studying the embryonic development of *Melophagus ovinus*, and, although the study is not yet completed, I am able to give a detailed account of the origin and early history of the imaginal discs in this insect. *Melophagus* is a cyclorrhaphic brachyceran. Leuckart† early showed

the striking similarity of its larval and pupal forms, and of the pupipars in general, to those of the muscids; in an earlier portion of this paper, I have emphasized the same fact; Müggenburg‡ has described the mouthparts of almost all the pupipars and homologised them with the parts of the fly's proboscis; Brauer§ considers the pupipars degenerate flies. The relationship between the pupipars and the muscids is undoubtedly a very close one, and observations on the former must be conclusive in determining the method of origin of imaginal discs in the latter, as well as in all the higher dipters.

In *Melophagus* the cephalic and thoracic imaginal discs first appear as local thickenings followed by invagination of the embryonic ectoderm. The cephalic discs make their appearance first, and very early in the ontogeny of the insect. The ventral plate, as in other dipters, is not confined to the ventral side of the embryo, but it encircles the anterior end and covers the anterior third of the dorsal side, as is shown in Fig. 5. The stomatodeum appears as an ectodermic depression on the dorsal side at some distance from the anterior end (S, Fig. 5), the proctodeum as a corresponding depression on the dorsal side, slightly distant from the posterior end (P, Fig. 5). These are not, however, the permanent positions of

* Graber. Vergl. Stud. über d. Embry. d. Insecten. Denks. Acad. Wiss. z. Wien. Bd. 56. p. 306.

† Leuckart. Die Fortpflanzung u. Entwick. d. Pupiparen. 1858.

‡ Müggenburg. Der Rüssel d. Diptera pupipara. Archiv f. Naturgeschichte. Jahrg. 58, 1832, p. 287.

§ Brauer. Systemat.-zool. Studien. 91. Bd. d. Sitzungsbr. d. Kais. Acad. d. Wiss. 1st Abt. 1885, p. 405.

these organs. They gradually migrate towards the two poles of the egg, and finally attain positions slightly ventral

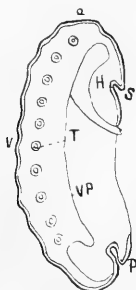


Fig. 5. Embryo *Melophagus*, side view; *a*, anterior end; *V*, ventral side; *S*, stomatodeum; *P*, proctodeum; *VP*, ventral plate; *T*, tracheal invaginations; *H*, head-fold.

to the anterior and posterior poles respectively. Long before the stomatodeum has attained its definitive position, however, there appear before and behind it crescentic, ectodermal thickenings which partly encircle it as shown in Fig. 6. These are the begin-

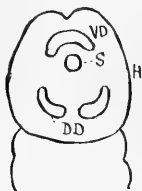


Fig. 6. Anterior end of embryo, dorsal view; *H*, head-fold; *S*, stomatodeum; *VD*, ventral disc; *DD*, dorsal discs

nings of the cephalic imaginal discs, which, it will be seen, appear very early in the ontogeny of the insect,

while, in fact, the intestinal tract, the tracheal, and nervous systems are in their first anlagen. The crescentic thickenings, now, are three in number, a pair just behind (*DD*, Fig. 6) and a single median one just before (*VD*, Fig. 6) the stomatodeum. The latter thickening is destined to form the ventral cephalic disc; the fate of the pair, on the other hand, is to form the dorsal discs, those homologous with the cephalic discs of *Musca*. At the posterior side of each of the latter thickenings, now, an invagination begins to appear which finally becomes a deep pocket. Each pocket early shows an intimate connection with a supra-oesophageal ganglion, the latter abutting the posterior side of the pocket, but having no structural union with it. During the formation of these pockets, however, the stomatodeum, together with the dorsal and ventral discs, has been continuing its migration towards the anterior end of the embryo, and the formation of the intestine and closure of the back of the embryo have been going rapidly forward. Finally, when the mouth has arrived at its definitive position at the anterior pole of the embryo, the dorsal pockets have come to occupy a position on the dorsal side of the embryo just above it, and the back is entirely closed.

The openings of the pockets have by this time moved to the mid-dorsal line and merged into a single median opening. In Fig. 7, *DD* represents this common opening. The proximal or upper portions of the pockets have also fused, but their distal ends are still free

from each other and each still abuts a supra-oesophageal ganglion. As to the median ectodermic thickening in Fig. 6 (V D) which is destined to form

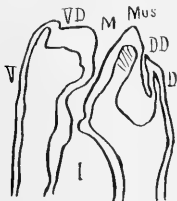


Fig. 7. Sagittal section of anterior end of embryo just before involution of head; *M*, mouth; *I*, intestine; *V D*, ventral disc; *DD*, dorsal discs; *Mus*, muscle projection; *V*, ventral side; *D*, dorsal side.

the ventral cephalic disc, it migrates forward with the stomatodeum, suffering at the same time a slight invagination, and finally takes a position immediately below the mouth (*V D*, Fig. 7). The relation of the other organs of the anterior portion of the embryo to the discs, is well shown in Fig. 7. Just dorsad of the mouth and between it and the median portion of the dorsal discs is seen a muscular projection (*Mus.*) whose later history will be found to be interesting.

A very important change now takes place in the development of the animal, namely, the involution of the embryonic head. An ectodermic fold starts just posterior of the discs, both dorsal and ventral, and grows rapidly forward towards and over the mouth. The mouth, with the ventral disc just ventrad of it and the muscular projection and dorsal discs just dorsad of it, is rolled in

by this process. A new mouth is formed (*M*, Fig. 8) and just back of it is a new portion of the intestinal tract (*P*, Fig. 8). This is the so-called pharynx of Weismann and Van Rees, described by them in the larva of *Musca*. Just back of the pharynx is the oesophagus and the old mouth, dorsad of which is the muscular projection (*Mus.* Fig.

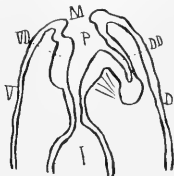


Fig. 8. Sagittal section of embryo just after involution of head; *M*, mouth; *P*, pharynx; *DD*, dorsal discs; *V D*, ventral disc; *I*, intestine; *Mus*, muscle projection; *V*, ventral side; *D*, dorsal side.

8). This projection becomes in the larva the most active organ in the animal. It is a sucking tongue and by its regular pulse-like contractions causes a flow of the milk-like secretion, which is present in the uterus and forms the food of the larva, into the mouth.* Connected with the dorsal wall of the pharynx is the fused median portion of the dorsal discs (*DD*, Fig. 8) which in Fig. 7 opened to the outside of the embryo. The distal portions of the discs represent diverticula which extend back to the supra-oesophageal ganglia. On the ventral side of the pharynx is the ventral disc (*VD*, Fig. 8) which shows a slight invagination and which is destined to undergo considerable changes

* Pratt. l. c. p. 170.

before it reaches its final form.* The forward end of the animal does not change materially, now, from the condition we find represented in Fig. 8 during the remainder of the embryonic and the entire larval period. Early in the pupal period, however, the dorsal and ventral discs unite to form the head vesicle, as explained in a previous portion of this paper, which becomes the imaginal head.

So much for the origin and embryonic history of the cephalic imaginal discs. The thoracic discs (with the exception of the dorsal prothoracic which arise in the larva) do not make their appearance until the time of the involution of the head. This is late in the embryonic life and at a period when its organization and the formation of the head discs are completed. The thoracic discs arise, like the cephalic, as ectodermic thickenings. A dorso-ventral section to one side of the median line of the same embryo of which Fig. 8 represents a sagittal section, is shown in Fig. 9. The

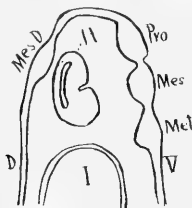


Fig. 9. Dorso-ventral section of anterior end of embryo; *Pro*, *Mes*, and *Met*, ventral pro-, meso-, and metathoracic discs; *Mes. D.*, dorsal mesothoracic disc; *H*, head-disc; *I*, intestine; *D*, dorsal side; *V*, ventral side.

three ventral ectodermal thickenings are the beginnings of the ventral pro-meso- and metathoracic imaginal discs on one side of the embryo. The dorsal thickening is the beginning of the dorsal mesothoracic disc. The dorsal metathoracic disc does not appear in this section. All these discs begin very soon to invaginate, the ventral prothoracic beginning first, then the mesothoracic, and finally the metathoracic taking its turn. The invagination begins in each disc at its posterior border as is shown in the ventral metathoracic disc in Fig. 10; then the anterior border sinks in as is shown in the mesothoracic disc in Fig. 10; finally the entire disc sinks beneath the surface as is shown in the prothoracic disc in Fig. 10; then the ecto-



Fig. 10. *Pro*, *Mes*, and *Met*, ventral pro-, meso-, and metathoracic discs, showing beginning of invagination.



Fig. 11. Disc with invagination completed.

derm closes over it as is shown in Fig. 11, at which stage it is comparable to the thoracic discs in *Corethra* as represented in Fig. 2. The disc now becomes separated from the ectoderm, the thickened middle portion sinks in and forms the disc

proper, the real anlage of the extremity, while the portion at the side becomes the parapodial membrane, and the disc is formed as we find it throughout the larval period (Fig. 3).

As to the discs of the internal organs and of the abdominal hypodermis, I have not observed them in the embryo and think it is probable they appear first in the larva.

Before closing I wish to dwell for a moment on one or two theoretical questions which naturally present themselves. In the first place, why is it that in the brachyceran dipters the phagocytes, that is the blood corpuscles, during the metamorphosis do not attack all the larval tissues indiscriminately instead of being selective in their operations. We find that in the histolysis certain organs only, such as the larval hypodermis, intestine, muscles, etc., are attacked and destroyed while others, such as the imaginal discs, the heart, central nervous system, reproductive glands, and even some of the muscles are left intact. Kowalevsky* seeks to answer this question. He says the reason is the same as that which accounts for the fact, first observed by Metschnikoff,† that certain *virulent* bacteria, as the form which is the cause of Anthrax, are not attacked by leucocytes, while the same form in Pasteur's vaccine for Anthrax, which has been weakened and robbed to a certain extent of its virulent power, is attacked and consumed. With

the beginning of the pupal stage in *Musca* the larval tissues, being no longer active, functional tissues, become weak and degenerate and are attacked and destroyed by the amoeboid blood corpuscles of the pupa, as are the non-virulent bacteria of the vaccine by the leucocytes. The imaginal discs, on the other hand, which are a fresh, young tissue, whose cells are rapidly proliferating, are immune, as are also the virulent bacteria. Kowalevsky also says that perhaps the tissue of the imaginal discs also secretes some substance which renders it secure against the attacks of phagocytes as do the virulent Bacteria. Van Rees‡ says that the phagocytes do, as a matter of fact, attack all the larval organs indiscriminately, but that the active metabolism of the cells of the imaginal discs preserves them from these attacks. He thinks Kowalevsky is probably right in supposing that the discs render themselves immune by some poisonous secretion.

It seems to me that the supposition of a protecting secretion is hardly necessary to account for the phenomenon, and it certainly would not account for the preservation of those functional larval tissues which are not destroyed. As soon as the larval life is over, in those organs and tissues which then become functionless and inactive, a healthy metabolism would cease, and they would begin to exhibit signs of weakness and degeneracy. In this condition they would be an easy prey to phagocytes or disintegrating influences of any sort.

*L. c. p. 555.

† Metschnikoff. Archiv f. pathol. Anat. Bd. 97, p. 512.

‡ L. c. p. 120.

Weak or functionless organs in any animal are peculiarly susceptible to disease. Healthy organs may be exposed to the same influences without danger. In the same way the imaginal discs, in which there is an exceedingly active metabolism, and *all the larval organs which remain functional during the metamorphosis* or during a greater part of it are immune from the attacks of the phagocytes. The heart in the muscids continues to beat, as Künckel d'Herculis has observed, during the entire period of the metamorphosis with the exception of a day or two in the latter half of it. The nervous system must continue functional during the entire time. The three pairs of thoracic muscles which pass intact from the larva to the imago are probably employed in respiration during the metamorphosis. The reproductive glands are, like the imaginal discs, rapidly growing organs. It would be interesting to know exactly to what extent the blood corpuscles in the other orders of insects besides the brachyceran dipters become phagocytes during the metamorphosis, and why histolysis is so much more extensive here than elsewhere. The answer would undoubtedly be in accord with what I have just said above. The brachycera are the most highly specialized insects; the structural differences between the larva and imago are the most profound; their metamorphosis is the most complete; but two or three of the functional, larval organs remain functional during the metamorphosis; amoeboid blood corpuscles in the form

of phagocytes consume the rest, sparing, however, also the imaginal discs from which the imaginal organs are built up. Among the other holometabolic insects, on the other hand, many or most of the larval organs remain functional during the metamorphosis, hence there is but little histolysis. But the larval intestine would always necessarily become unfunctional, and, as we have seen, Kowalevsky is of the opinion that the larval midgut in all holometabolic insects contains imaginal discs and undergoes degeneration during the metamorphosis.

It is interesting to note that each of the three thoracic and eight abdominal segments which make up the larval body in the brachyceran dipters has two pairs of imaginal discs, a dorsal and a ventral pair. Thus there is a double row of discs extending the length of the body on the dorsal side and another on the ventral side of the larva. This is seen especially well in *Melophagus* where the thoracic discs are near the surface and not in the center of the larva as they are in *Musca*; the thoracic discs are here in straight rows with the abdominal ones. The question now presents itself,—are the thoracic and abdominal discs homodynamous organs. The different discs furnish very different imaginal organs; legs, wings, pupal spiracles, balancers, and hypodermis grow from the thoracic, and hypodermis, rectal glands, and perhaps external sexual organs from the abdominal discs; but yet they are all similar to each other in several very important respects. In the first place the method of ori-

gin is exactly the same in all. They all arise as ectodermal thickenings either in the embryo or in the larva; and further, the position of each pair whether dorsal or ventral, in each segment whether thoracic or abdominal, is the same as that of every other pair. The thoracic thickenings, it is true, develop further and become folds or pockets of the ectoderm because they must furnish the legs and wings of the imago, while the abdominal discs do not develop into pockets, with the exception of those of the external sexual organs*. Then again the thoracic and abdominal discs are alike in that they all help to form the imaginal hypodermis.

It seems to me that the *ventral* thoracic and abdominal discs at least, are homodynamous organs. There can be no doubt that the ventral discs of the different thoracic segments are homodynamous among themselves, likewise the ventral discs of the different abdominal segments among themselves. The ventral thoracic discs, too, are undoubtedly homologous to the thoracic extremities of the other insects; and I think there can be no doubt that the ventral abdominal discs are homologous to the rudimentary extremities which appear in the embryos of all other insects, *but not in the brachyceran dipters*. But the thoracic and the embryonic abdominal extremities in other insects are undoubtedly homodynamous organs, therefore, the ventral thoracic and abdominal imaginal discs in the brachycera

are also homodynamous organs, as things which are equal to the same thing are equal to each other. In the thorax these organs furnish the legs and the ventral half of the imaginal hypodermis, in the abdomen they furnish only the hypodermis, there being no legs. The two pairs of discs which furnish the external sexual organs are. I think, the ventral discs of the absent ninth and tenth abdominal segments.

When we consider the dorsal discs we find the matter is much more difficult. We cannot prove that the dorsal thoracic and the dorsal abdominal discs are homodynamous in the same way, because the dorsal abdominal surface of the insect has no extremities and no rudiments of any at any time. But I think, although reasoning from analogy is very unsafe in such matters, it is at least very probable that the same homodynamy exists on the dorsal side as on the ventral side of the insect. The dorsal discs have exactly the same appearance on the thorax and abdomen as the ventral discs, and the same method of origin, and if these facts go for anything there can be no doubt of the homodynamy.

If, now, this is really the case, what is its significance? The ventral discs, thoracic and abdominal, are homologous to extremities. The dorsal thoracic discs are homologous to wings. If they and the dorsal abdominal discs are homodynamous organs, are the latter homologous to wings, too? Such an assumption is of course impossible, but it is not impossible that there

* Pratt, l. c. p. 197.

existed in some previous phyletic stage, paired rows of external, segmental organs running down the back of the insect from one end to the other, just as the legs at one phyletic period extended the entire length of the ventral surface, and still do in the very lowest insects, and further, that on the thorax these organs developed finally, in the evolution of insects, into wings. Tracheal gills might represent such organs. And the fact that the dorsal prothoracic discs in *Musca* and the nematocera develop into the pupal spiracles lends great weight to this notion as these, like the tracheal gills, are respiratory organs. The well known theory of Gegenbaur and Lubbock, tracing the origin of wings in insects to tracheal gills, seems thus to obtain a new support.

Another matter which seems worth mentioning is that in different holometabolic insects, the extremities or the thoracic and abdominal imaginal discs (when such are present) may appear at very different times in the ontogeny. In some insects these appear early, and in some late, in the embryonic development, in some early, and in some

late, in the larval development. For instance, in the lower orders of holometabolic insects, as in those having incomplete metamorphosis, the anlagen of the extremities appear very early in the embryo. In *Melophagus* the thoracic discs, homologous organs, appear rather late in the embryo, while the abdominal discs appear probably early in the larval period. In *Corethra* the imaginal discs, also homologous to extremities, delay their appearance until just before pupation. Thus the epigenetic period in insects, when new organs are forming, does not end with the birth of the larva from the egg, but extends over the larval and even over the pupal period. The embryonic development of the insect really does not end until the imago bursts from the puparium, the embryonic, larval, and pupal periods being essentially identical. The principal significance of the pupal period and the metamorphosis is that it is the time when the larval characters which were adopted for use during a period of free life in the midst of the development, and which would be valueless to the imago, are corrected or abandoned.

DIAPHEROMERA FEMORATA.

I FIND among my notes the following observations on this insect in captivity.

The general color of the female is brown, marked by streaks and dots of a lighter brown or shaded darker at the sides of the body and at each joint. The face is orange, the antennae and palpi brown. The legs have a greyish green tinge and are lighter

than the body, but darker at the ends of the joints. The fore legs are always different in color from the others being brown above and dull yellow below and when stretched forward beside the appressed antennae (which just surpass them), as is always the case at rest, they make the insect appear a third longer than it is. They eat the edge of a leaf, usually straddling it with their legs and in an hour will devour a piece an inch long

by a third of an inch wide; the heavier veins of the oak are avoided. They are exceedingly slow in movement. One remained almost motionless for four or five hours and then climbed the side of the box slowly and cautiously.

The earliest pairing of the sexes was noted Sept. 22, and a male was in one instance almost continuously coupled with a female for eight days, and died immediately afterward, while the female lived until December 10, laying eggs at intervals. Mr. L. Trouvelot who also reared this insect found that the male usually died within two days after the close of copulation. One female laid 38 eggs between Sept. 10 and Oct. 5 and died Oct. 11 with 15 developed and 5 or 6 undeveloped eggs in her ovaries. The eggs are dropped loosely upon the ground and it has repeatedly happened to Mr. Trouvelot and myself that eggs which did not hatch after the winter had passed went over a second winter and then gave out the young. Out of 110 eggs laid one October only 7 hatched the next year, in July; in another year the earliest eggs hatched June 22.

Mr. J. Elliot Cabot informed me that at Beverly, Mass., the country people call these insects "witches horses."

Samuel H. Scudder.

PROCEEDINGS OF THE CLUB.

9 October, 1896.—The 193d meeting was held at Mr. S. Henshaw's, Mercer Circle, Cambridge. Mr. A. P. Morse in the chair.

Mr. S. Henshaw showed specimens of *Troides euphorum* from Cooktown, Queensland, Australia.

Some discussion followed, in which all participated, upon the abundance of the following insects around Boston during the past summer, *i. e.*, the army worm (*Leucania unipuncta*), the larvae of *Lachnosterna*, *Cryptorhynchus lapethe* and *Papilio phileor*.

Mr. J. W. Folsom spoke of a new species of myrmecophilous *Smynturus* in which the eyes are wanting and remarked upon its characters and upon the habits of myrmecophilous *Thysanura*. He showed drawings of the new species.

Mr. R. Hayward spoke briefly upon *Phengodes plumosa*. Glow-worms were very abundant in Milton during the past summer, but although he had searched carefully for them, he had found but one male imago and that at a considerable distance from where the glow-worms were seen. They had fed in captivity upon earthworms and a species of *Julus*.

13 November, 1896.—The 194th meeting was held at Mr. S. Henshaw's, Mercer Circle, Cambridge, Mr. A. G. Mayer in the chair.

Mr. E. A. C. Olive and Miss Mabel Olive of Cooktown, Queensland, Australia, were elected to active membership.

Mr. A. G. Mayer gave an interesting account of his recent trip to Australia and briefly mentioned his observations on the insect fauna, as well as his general impressions of that region.

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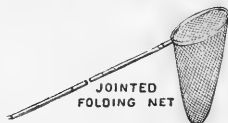
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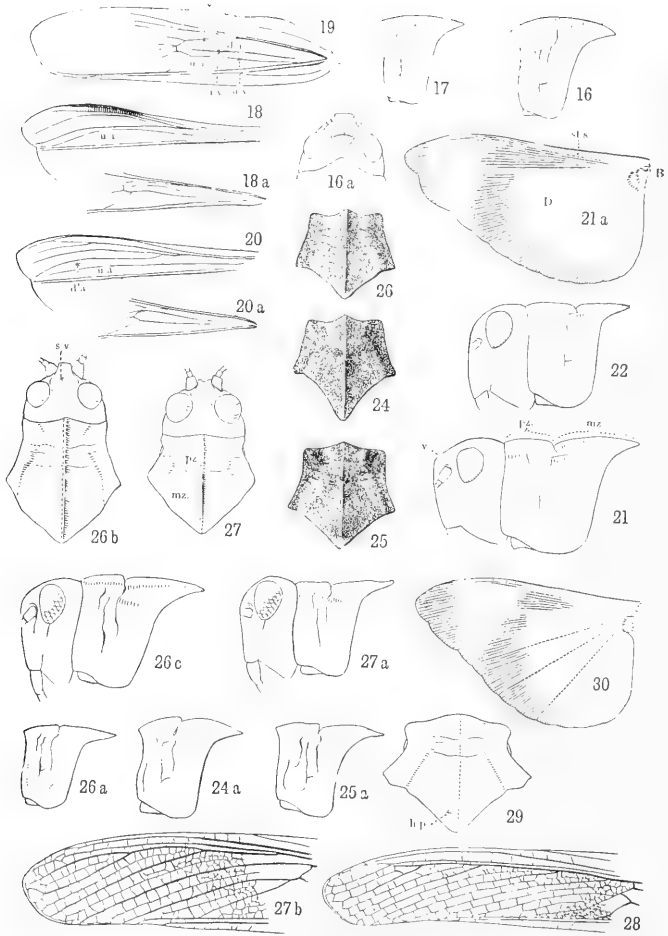
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MORSE.—NOTES ACRID. N. E., III.—OEDIPODINAE.

EXPLANATION OF PLATE 2.

- Fig. 16. *Arphia xanthoptera* ♂, pronotum from side.
 " 16a. " " ♂, head from above.
 " 17. " *sulphurea* ♂, pronotum from side.
 " 18. *Chortophaga viridifasciata* ♂, part of wing.
 " 18a. " " ♂, part of tegmen.
 " 19. *Encoptolophus sordidus* ♂, tegmen (in part).
 " 20. *Camula pellucida* ♂, part of wing.
 " 20a. " " ♂, " " tegmen.
 " 21. *Hippiscus tuberculatus* ♀, head and pronotum from side.
 " 21a. " " ♂, wing.
 " 22. " *rugosus* ♀, head and pronotum from side.
 (Species 23, *Dissosteira carolina*, is not figured.)
 Fig 24. *Spharagemon collare scudderi* ♀, pronotum from above.
 " 24a. " " ♀, " " side.
 " 25. " *saxatile* ♀, pronotum from above.
 " 25a. " " ♀, " " side.
 " 26. " *bolli* ♀, " " above.
 " 26a. " " ♀, " " side.
 " 26b. " " ♀, head and pronotum from above.
 " 26c. " " ♀, " " side.
 " 27. *Scirtetica marmorata* ♀, " " " " above.
 " 27a. " " ♀, " " " " side.
 " 27b. " " ♂, tegmen, distal part.
 " 28. *Psinidia fenestralis* ♂, " " "
 " 29. *Trimerotropis maritima* ♀, pronotum from above.
 " 30. *Circotettix verruculatus* ♂, wing.

B. = base of wing, — 21a.

D. = disk of wing, — 21a.

d. a. = discoidal area, — 19, 20.

h. p. = hind process of pronotum, — 29.

i. v. = intercalary vein, — 19.

mz. = metazona, — 21, 27.

pz. = prozona, — 21, 27.

r. v. = radial vein, — 19.

sf. s. = subfrontal shoot, — 21a.

s. v. = scutellum of vertex, — 26b.

u. a. = ulnar area, — 19, 20.

u. v. = " vein, — 19.

v. = vertex, — 21.

PSYCHE.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—II.

BY ALBERT P. MORSE, WELLESLEY, MASS.

KEY.

1. Wings black, with a pale border Sp. 23, *Dissosteira carolina*.
- 1¹. Wings not black.
 2. Disk of wings nearly or quite transparent, not distinctly bounded by a blackish border (cf. Fig. 21a).
 3. Intercalary vein of tegmen nearer ulnar than radial vein for its entire length; discoidal area as wide as widest part of ulnar area (Fig. 19). Wings faintly clouded with dusky at tip and usually transparent yellowish at base. Sp. 19, *Encoptolophus sordidus*.
 - 3¹. Intercalary vein of tegmen approximated distally to radial vein. (Figs. 18a, 20a.)
 4. Discoidal area of tegmen much narrower than distal end of ulnar area (Fig. 18a). Ulnar area of wing broadened distally at expense of discoidal area, being three times as wide (Fig. 18). Wings faintly clouded with dusky opposite middle of hind margin.
Sp. 18, *Chortophaga viridifasciata*.
 - 4¹. Discoidal area of tegmen about equal in width to distal end of ulnar area (Fig. 20a). Wing with distal part of ulnar area not broadened, about equal to discoidal area in width (Fig. 20). Wings with dusky venules and transparent except for faint dusky clouding at extreme tip and sometimes a slight opacity at extreme base.
Sp. 20, *Camnula pellucida*.
 - 2¹. Disk of wings opaque, colored (white, yellow, orange, red), distinctly bounded by a blackish border (Figs. 21a, 30).
 - 5 (5¹, 5²). Carina of pronotum entire, unnotched in side view (Figs. 16, 17). Scutellum of vertex with a distinct, usually deep, transverse curved impression (Fig. 16a). Antennae about equal to head plus pronotum. Disk of wings bright yellow.

6. Hind process of pronotum acute-angled in dorsal view, its sides concave. Carina of pronotum in side view crestlike, high, arched, compressed (Fig. 16). Dusky band of wing with sub-frontal shoot extending usually one-fourth to one-third the distance across disk to base of wing.

Sp. 16, *Arphia xanthoptera*.

6¹. Hind process of pronotum about right-angled, ♂, or a little obtuse, ♀; carina rather low (Fig. 17). Dusky band of wing with sub-frontal shoot usually extending two-thirds of the distance to base of wing.

Sp. 17, *Arphia sulphurea*.

5¹(5²). Carina of pronotum with one notch or incision in side view. Scutellum of vertex without deep transverse arcuate impression.

7. Width of dusky wingband taken on subfrontal shoot two or three times its width elsewhere (Fig. 21a). Antennae short, equal to head plus pronotum or but little longer (if longer the prozona and metazona of equal length). Robust species.

8. Prozona distinctly shorter than metazona. Vertex prominent (Fig. 21). Hind process of pronotum acute or right-angled. Wings usually red. Antennae short, equal to head plus pronotum.

Sp. 21, *Hippiscus tuberculatus*.

8¹. Prozona and metazona of equal length; the lateral carinae not cut by principal sulcus (Fig. 22). Vertex convex, the scutellum but little impressed, divided by a median and two oblique carinulae. Hind process of pronotum obtuse-angled. Wings usually yellowish, sometimes orange or red.

Sp. 22, *Hippiscus rugosus*.

7¹. Width of dusky wingband on subfrontal shoot rarely over once and a half its width elsewhere. Antennae long, once and a half or twice as long as head plus pronotum. Slenderer species, the body often compressed.

9 (9¹, 9²). Hind tibiae not dusky-ringed. Hind part of disk of prozona elevated, rising broadly on the carina.

10. Carina high, arched; the cleft oblique, the lobes sometimes overlapping (Fig. 24a). Hind process acute, its sides concave (Fig. 24.) Hind tibiae red, sometimes paler at base.

Sp. 24, *Spharagemon collare scudderi*.

10¹. Carina rather low, usually sinuate on prozona; cleft nearly or quite vertical (Fig. 25a). Hind process about right-angled, its sides straight (Fig. 25). Hind tibiae distinctly pale-ringed next base.

Sp. 25, *Spharagemon saxatile*.

9¹ (9²). Hind tibiae ringed with dusky and coral-red, and pale next base.

11. Carina rather high, reaching level of top of head. Eyes not prominent. Vertex projecting the width of an eye. Body distinctly compressed. (Figs. 26-26c). Sp. 26, *Spharagemon bolli*.
- 11¹. Carina low. Pronotum constricted on prozona and depressed below top of head. Eyes prominent. Vertex short, less projecting. Body little compressed (Figs. 27-27b).
Sp. 27, *Scirtetica marmorata*.
- 9². Hind tibiae ringed with dusky and yellowish white. Prozona much constricted. Tegmen with many of the distal cellules in the hinder part of the distal half two to four times as long as wide.
Sp. 28, *Psinidia fenestralis*.
- 5². Carina of pronotum with two distinct notches, the anterior often less marked than the posterior.
12. Transverse dusky band of wings broad throughout (at least as broad as the width of a tegmen), continuous. Anterior notch of pronotum often shallow.
13. Tegmen with most of the cellules in the hinder part of the distal half but little longer than wide (Fig. 27b). Hind tibiae pale (ashy or rose) at base, ringed beyond with dusky and coral-red. . . . Sp. 27, *Scirtetica marmorata*.
- 13¹. Tegmen narrow, many of the cellules in hinder part of distal half two to four times as long as wide (Fig. 28). Hind tibiae ringed with dusky and yellowish white.
Sp. 28, *Psinidia fenestralis*.
- 12¹. Transverse dusky wingband narrow, usually discontinuous behind subfrontal shoot (Fig. 30). Carina of pronotum very low, the notches almost equally distinct.
14. Hind tibiae entirely pale. Radial veins of wing not enlarged (cf. Fig. 30). General color pale brown or buff and white. Sides of pronotum usually distinctly angulate at meeting of lower and hind margins (Fig. 29).
Sp. 29, *Trimerotropis maritima*.
- 14¹. Hind tibiae dusky at tip and usually also at two-fifths of the distance from base to tip, elsewhere yellowish white. Radial area of wing expanded and two or three radial veins distinctly enlarged (Fig. 30). General color dark gray or black.
Sp. 30, *Circotettix verruculatus*.

DIPTERA FROM THE HEADWATERS OF THE GILA RIVER.— I.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

The Rio Gila takes its head in the mountains of southwestern New Mexico, in northern Grant and southern Socorro counties. A short distance above the Gila Hot Springs, which are about forty miles by trail north of Silver City, the river splits into its three forks, known as the West Fork [sometimes called Diamond Creek], the Middle Fork, and the East Fork. These streams follow down small cañons, which wind up into the mountains. About fifteen to eighteen miles up the first there occur what are known as the Falls of the West Fork. Most of the West Fork collecting in diptera, as well as other insects, was done about two miles below the falls, where the permanent camp was made. It was all done in the bottom of the cañon, the elevation being probably about 7000 ft. Some collecting was also done on the East Fork, which was followed up past the D-D-Bar ranch, and out into the basin where, at the base of the Black Range, is situated the V-Cross-T ranch. The determinations of the East Fork diptera, as well as of further material from the West Fork, will appear in a second paper. All the specimens were collected by the writer, in July, 1894.

Chrysops ceras n. sp. West Fork. Six ♀s. Four of them taken July 10, about five miles above Gila Hot Springs; and the others July 16 and 17, about fifteen miles above, at camping place.

Length, $8\frac{1}{2}$ to $9\frac{1}{2}$ mm. Very near to *C. megaceras* Bell., and *C. tanyceras* O. S. From *C. megaceras* it differs in the presence of a cinereous border to mesoscutum and scutellum; all the tarsi excluding metatarsi, blackish; the rest of legs yellowish; antennal joints 1 and 2 yellowish-brownish, no yellowish vestiture on face; and in the yellowish-cinereous borders to abdominal segments. It agrees with *C. megaceras* in the shape and length of the antennal joints very closely, thus differing markedly from *C. tanyceras*, from which it further differs by the front and face being cinereous pollinose, shape of frontal callosity unlike an ace of spades, palpi mostly blackish but partly yellowish, a median linear vitta between the thoracic pair, and in other minor points. Both basal cells are wholly clear. The relative length of the antennal joints in *C. ceras* is about $3\frac{1}{2}$ (rarely 4) : 3 : $1\frac{1}{2}$ [sometimes $1\frac{3}{4}$]. The first and second joint seem sometimes to be almost equal, and the third is often only half as long as the second. It will thus be seen that this species goes a step farther in this particular direction of antennal development than does *L. megaceras*, which is the nearest species to it in this regard, next to *megaceras* being *tanyceras*. It may be noted also in this connection that these three species are all of a general brownish color, and have the wings obscurely clouded.

♀. Front clothed with grayish pollen which has a brassy tinge except near antennae, ocellar area brownish with a slightly fuscous tinge around it; frontal callosity brown, more or less rounded diamond-shaped, wider than long. Some black hairs on front. Antennae pale yellowish with a decided fuscous tinge, clothed with fine black hairs; third joint black or blackish-brown, pointed-conical, bulbous at base. First antennal joint in one specimen quite fuscous, second joint quite yellowish. Face yellowish clothed with gray pollen, with a yellow, brownish-yellow, or brownish callosity on each side, and a smaller black or blackish-brown one on each cheek. Palpi pale brownish, or brownish-yellow. Thorax soft brown, with a median pair of widely separated parallel brassy-yellowish vittae hardly reaching scutellum, an interrupted one also on lateral edge of thorax which is continued around edge of scutellum, the rest of latter being of the brown color of the thorax. Pleurae gray pollinose. The four yellowish-gray vittae of thorax leave the brown in the form of three rather heavy vittae. Abdomen soft rather dark brown, hind corners of first segment gray pollinose; hind borders of second to sixth segments brassy-yellowish, broader on sixth segment, prolonged anteriorly on median line in a pointed vitta not reaching front border of segment, this point being quite obsolete on sixth segment, seventh segment (as much as is visible) wholly brassy-yellowish. Legs yellowish; hips, knees, ends of tibiae, and all of tarsi brown or blackish, except metatarsi, only the distal ends of which are black. Knees sometimes without any black or brown. Venter wholly silvery-gray pollinose. Wings with fuscous clouds on stigmal area, on cross-vein at proximal end of first submarginal and first posterior cells, on cross-veins at distal end of discal cell (or bases of 2d and 3d posterior cells), on furcation of third vein, and at base of fourth posterior cell. Only a faint tinge of fuscous elsewhere,

becoming faintly yellowish on basal half of wing, and with an irregular whitish area on apical portion. Halteres soft brown, sometimes with a paler shade.

Chrysops facialis, n. sp. West Fork. July, 19. One ♀.

♀. Length, 8 mm. excluding antennae. Front fully one-third width of head, blackish or brownish, clothed with yellowish-gray pollen. Ocellar area oblong, black, polished, reaching nearly to the eye on either side, connected by a fuscous spot with the frontal callosity in front of it; latter shining polished brown, with a yellowish shade on front portion and a blackish shade behind, elliptical, about twice as wide as long. Antennae black, second joint about three-fourths as long as first and reddish on underside, first joint yellowish below and considerably so on sides. Front silvery pollinose in the narrow space between frontal tubercle and antennae. Face yellow, with silvery pollen at upper corners, yellow pollen in middle and down cheeks, a large shining black callosity on each cheek, and four shining brown callosities across middle of face. Palpi blackish-brown, lancets yellowish. Occiput grayish-brassy. Underside of head with whitish hair. Thorax shining black, with a pair of median yellowish-gray vittae separated by a brownish line, a black line on the outside of these, a grayish-brassy stripe on each side and two below on pleurae parallel with it. Thorax thinly clothed on dorsum and pleurae with yellow hair, thicker lines of which follow the lateral and upper pleural pollinose stripes. Scutellum shining black, faintly grayish pollinose, with yellowish hairs. Abdomen yellow, first segment with two large coalesced median black spots leaving only a dot of yellow on middle of hind margin, second and third segments each with a black marking formed by the coalescing anteriorly of two sub-rectangular spots which leave a median yellow angle invading the black marking behind,

fourth and fifth segments each with four of these sub-square black markings united along front border, sixth segment wholly black. Abdomen thinly yellow-hairy. Legs yellow, the hips, knees, ends of tibiae, and whole of tarsi black, except middle and hind metatarsi and next tarsal joint which are yellow, only the distal ends being black. Wings with the first basal cell more than half clouded proximally, the second basal cell less than half, the anal cell not at all except narrowly in distal end, the two basal cells being also clouded in distal ends. The distal ends of the marginal and first submarginal cells with an apical cloud, which extends into the second submarginal cell. The median broad black cross-band of wing invades slightly more than the proximal half of the first submarginal and first posterior cells, the whole of discal cell, less than proximal half of second posterior cell, about half of third posterior, all but the distal end of fourth posterior, and hardly the proximal half of fifth posterior, besides also the distal ends of the anal and basal cells as above mentioned. The clear portion of basal half of wing is whitish, except for the broad border of anal angle which is very faintly cloudy; likewise there is a white distal border to the middle transverse band, leaving the clearer portion of apical half of wing also very faintly clouded. Halteres yellow.

Eristalis latifrons Loew. Head of East Fork. D-D-Bar ranch. July 22. Three ♂s, and one ♀. Length, 10 to 12 mm. The ♂s are all the normal form, without cloud on the wings and with the lateral triangles of second abdominal segment distinctly yellowish. The ♀, however, belongs to the variety mentioned by me in Trans. Am. Ent. Soc., xxii, p. 49. It has the conspicuous cloud on the wings, and the triangles of second segment are pale

brownish, but showing yellowish on inner angle. The opaque interrupted fascia of third segment is obsolete in this specimen.

Chrysochlamys croesus Q. S. West Fork. July 12. Two ♀s. Length, 10 to 11 mm. They agree well with Williston's description (Syn. Syrph.).

Dejeania corpulenta Wied. West Fork. July 16. One ♀. Length, 15 mm. The frontal bristles do not descend more than one or two below base of antennae. Ground color of head and thorax rich brassy-golden or pale old gold, the palpi several shades darker than head and thorax but still somewhat lighter than the reddish-yellow legs. Otherwise it agrees well with V. D. Wulp's supplementary description in Biol. C. A. Dipt., ii, p. 10.

Myobia gilensis n. sp. West Fork. July 16. One ♂. Length, 8 mm. Near *M. diadema* Wd., and *M. flavipennis* Wd.

♂. Face and front silvery-white, frontal vitta rusty-golden. Antennae yellow, distal half of third joint and all of arista dusky brownish. Third antennal joint two or three times as long as second. Palpi reaching nearly to epistoma, slender, yellowish. Proboscis slender, yellowish on basal half, dusky brownish apically. Front at vertex about one-sixth width of head, widened before base of antennae. Frontal vitta fully as wide as sides of front. Face receding, epistoma prominent. Cheeks and underside of head silvery. Occiput cinereous, golden near vertex. Thorax cinereous, humeri and pleurae more silvery. A very faint brassy shade to thorax, scutellum quite golden. Four strong bristles on margin of scutellum. Abdomen yellow, second and third segments with a

median longitudinal cinereous stripe, spreading out on hind border of third segment and covering fourth. No discal macrochaetae. Legs long, yellowish, tarsi black. Front tarsi considerably longer than front tibiae, but not nearly twice as long. Other tarsi

but little shorter than front tarsi. Wings clear, third vein with three or four bristles at extreme base. Tegulae saturate tawny, halteres yellow-white. Apical cell very narrowly open, ending but little before actual tip of wing.

A SOUTHERN RACE OF DATANA PERSPICUA GR. AND ROB. (VAR. MESILLAE).

BY T. D. A. COCKERELL, MESILLA, NEW MEXICO.

On July 20, 1896, Mr. Sherfey, our superintendent of schools, brought me great numbers of a larva on *Rhus canaënsis* (*aromatica*), which he had found in his garden in Mesilla, New Mexico. I was surprised to see that they belonged to *Datana*—a genus I had never before seen or heard of in New Mexico. On comparing them with the descriptions in Dr. Packard's recent magnificent monograph, I felt sure, from the concolorous hairs and other characters, that I had before me a variety of *ministra*, similar to, but not identical with, the var. *californica* (Riley). The larvae were 35 mm. long, and differed from the description of *ministra* by the dark reddish prothoracic shield; the base of the legs was dull crimson; head black; lines on body sulphur yellow.

On July 22, Mr. Sherfey brought me eggs and young larvae from the same bush, showing some irregularity in the broods. The eggs were laid in great numbers, touching, on the under side of the leaf; they were chalk-white, rounded, rather low, hardly shiny, not perceptibly sculptured, with the usual black speck. The young larvae were dark crimson with chrome yellow lines and black heads.

Mr. Sherfey kindly undertook to raise the moths for me, and they emerged in numbers at the middle of August. To my surprise, the moths were evidently not *ministra*, but

belonged with *perspicua* and *robusta*. Dr. H. G. Dyar, to whom I sent specimens, assures me that they are *perspicua*, slightly tending in the direction of *robusta*, but still unmistakable *perspicua*. A comparison with Dr. Packard's figures entirely supports this view, but the oblique streak to the apex of the primaries is almost or quite obsolete.

D. perspicua is a northern species, which does not appear to give off any southern segregates in the eastern U. S.; but in the Central Region we had already a very distinct offshoot, the *D. robusta* Strecker, 1872, found in the Lower Sonoran zone in Texas. Mesilla, as Prof. Townsend and the writer have shown elsewhere, is in the Upper Sonoran, and it is therefore not surprising that the representative of *D. perspicua* should be different from *robusta*, and more closely approximate to the type. That the modification is more marked in the larva than in the imago is interesting, but not surprising, considering that the moths are nocturnal, while the larvae are exposed in broad daylight, and doubtless possess warning colors.

It appears that *D. perspicua* has been taken by Prof. Gillette at light. In Mesilla, when the moths must have been emerging in great numbers, I never took any at light.

For this Mesilla race of *D. perspicua*, I will propose the varietal name *mesillae*.

LIFE HISTORY OF SYNTOMEIDA MINIMA GROTE.

BY HARRISON G. DYAR, NEW YORK.

Only recently I had the pleasure of adding this little moth to our fauna (Ent. news, vii, 69) and now I am able to present its life history. The larvae were found at Miami, Florida in December, 1896, on a creeping plant which looks like a little holly and grows in the pine barrens among the saw palmetto and "coontie." The plant is *Myginda ilicifolia*, as I learn from Mr. Kinzel. A few moths were seen at the same time, and from them some eggs were obtained. There are five larval stages, occasionally, perhaps often, more, but there is no difference in appearance.

Egg. Sharply conoidal, rather pointed above, narrowed at base; smooth, shining, light ochre yellow, with a very bright pearly white reflection on the side. Shell white, under a half inch objective, lustrous, iridescent, smooth, without reticulations. Diameter .8, height .7 mm. Laid singly, or two to seven together on the back of a leaf of the food plant.

Stage I. Light orange, immaculate, smooth, slightly shining, segments distinct; width of head .5 mm. Setae rather long, blackish, iv and v whitish. On the thorax three setae from a large subdorsal wart and a small one below; a stigmatal and subventral tubercle all normal for the family. On the abdomen i and ii normal, large, iii with two setae, iv very small, v rather large, leg plate with several short setae. Subprimary setae all absent.

Stage II. All orange, warts concolorous, small, rather smooth. Hair fine, not dense, in spreading tufts, light slate gray, composed of dark and pale hairs; width of head .75 mm.

Stage III. Orange, immaculate, the hair thin and gray; head 1.1 mm.

Stage IV. Joint 2 retracted; three warts on the thorax. Skin smooth, orange red, irregularly shaded with grayish dorsally and in a distinct, broad, diffuse, subventral band. Warts small, concolorous, grayish in the gray marks, normal, iv absent except on joint 12, where it is represented by two tiny hairs. Hair not long, thin, not abundant and not concealing the body, slaty gray, growing in small spreading tufts. Head light orange; width 1.7 mm., rounded, scarcely bilobed. Hairs finely simply barbed, under a lens blackish and pale mixed. There are no tufts or plumes.

Stage V. Head rounded, light orange with pale hairs; width 2.4 mm. Warts normal for the Eucharomidae except for the absence of wart iv. Ground color of body orange red; a heavy, wide and diffuse dorsal band reaching to wart ii and a second band from wart iii to the feet, slightly interrupted around the whitish spiracles, thus making the body dark with a lateral red band. Warts concolorous, dark, rather small. Hairs barbed, gray, black and whitish mixed, except from wart i and ii above on joints 5 to 12, where they are darker and thick, almost tufted, forming a series of short, separated, ill-consolidated brushes. Venter and feet orange. Length about 20 mm. There is considerable variation in the amount of blackish shading present in the last stage. One larva spun in the plumage of stage IV.

Cocoon elliptical, composed of hairs and silk, moderately firm, but scarcely opaque; only a few of the hairs sticking straight through.

Pupa uniformly light brown, smooth and shining.

EDWARDS' BUTTERFLIES N. A.

The plates of the concluding part of Edwards' great work on North American butterflies, are entirely devoted to species of *Chionobas*, all containing abundant illustrations of the early stages. In the volume now concluded, moreover, Edwards has figured with a wealth of illustrations the complete or almost complete life-histories of no less than a dozen species of this boreal genus, which would seem, from the out of the way places one must reach to find the insect at all, to be the most difficult genus of our butterflies to treat in this way. It is a monument to the author's energy and skill. Numerous supplementary notes on various butterflies are added to this concluding Part, besides an index to the three quarto volumes now issued. We can but congratulate the author on the handsome completion of his nearly thirty years work, but we wish they were more to come.

PROCEEDINGS OF THE CLUB.

11 December, 1896.—The 145th meeting was held at Mr. S. Henshaw's, Mercer Circle, Cambridge, Mr. J. W. Folsom in the chair; Mr. W. L. W. Field was chosen secretary pro tempore.

Mr. S. Henshaw exhibited a specimen of a tropical cockroach (*Hormetica* sp.), captured in Belmont, Mass.; it is supposed to have been brought north in a bunch of bananas.

Mr. W. L. W. Field told of the capture of a male and female of *Libythea buckmani* in Milton, Mass., on July 17 and Aug. 9, respectively, by Mr. C. O. Zerrahn; and of the capture of a single battered male of *Meganostoma caesonia* in Alstead, N. H. on July 25, 1896 by Mr. James A. Field.

Mr. J. W. Folsom exhibited a collection of miscellaneous specimens, mostly spiders and cochroaches, the result of a visit to a banana vessel now discharging her cargo in Boston.

8 January, 1897.—The 196th regular and 20th annual meeting (since incorporation) was held at 156 Brattle St., Mr. A. P. Morse in the Chair.

The several annual reports were read.

The following officers were elected: President, H. G. Dyar of New York; Secretary, Roland Hayward; Treasurer, Samuel Henshaw; Librarian, Samuel H. Scudder; Executive Committee at large, A. P. Morse and S. H. Scudder.

The annual address of the retiring President, H. S. Pratt, on Imaginal Discs in Insects, was read by S. H. Scudder. (Printed in *Psyche* for February).

The Treasurer and Secretary were appointed a committee to revise the list of Active Members of the Club.

Mr. A. G. Mayer read a paper on a new hypothesis of seasonal dimorphism in Lepidoptera, which was discussed by Messrs. Scudder, Morse and Folsom, and will appear in full in *Psyche*.

Mr. S. H. Scudder stated that during a few days collecting on Mt. Desert Isl., Me., in the latter part of August, he only came across 13 different kinds of Orthoptera and none of them were very abundant. On the top of one of the highest mountains, Mt. Sargent (about 1400'), *Melanoplus manicus* and *M. fasciatus* were found, which did not occur below, but *M. atlantis* was common and *M. femur-rubrum* not observed, while at low levels *M. atlantis* was scarce and *M. femur-rubrum* common. Besides the latter species, the only common forms at the lower levels were *Nemobius fasciatus*, *Camnula pellucida*, *Circotettix verruculatus*, *Stenobothrus curtippennis*, *Orphula maculipennis*, and *Melanoplus femoratus*. Hardly a single locustarian was seen and very few indeed heard. The other species noted were *Scudderia pistillata*, *Monotettix cristatus* and *Chortophaga viridifasciata*. Only 7 species of butterflies were seen and insects of all sorts were exceptionally scarce.

Mr. Scudder also stated that he had received from Prof. C. M. Weed the Orthoptera he collected in Bermuda on a recent visit. There were but six species; *Labidura riparia*, *Periplaneta australasiae*, *Leucophaea surinamensis*, *Orphula olivacea*, *Conocephalus fusco-striatus* and a species of *Gryllus* apparently new.

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PSYCHE.

A NEW HYPOTHESIS OF SEASONAL-DIMORPHISM IN LEPIDOPTERA. — I.

BY ALFRED GOLDSBOROUGH MAYER, CAMBRIDGE, MASS.

(1). *Previous Researches.*

In 1830 it was discovered that the two European butterflies *Vanessa prorsa* and *Vanessa levana* were in reality only different broods of one and the same species of insect. The chrysalids of the last summer's brood winter over and give rise to butterflies of the light colored, or levana, type. Then follow several summer generations all of the prorsa type, having wings of a dark brown color. The chrysalids from the last prorsa generation winter over and produce levanas the next spring. There is, however, in addition to the forms levana and prorsa, an intermediate form, porima, which is very rarely met with in nature; and, indeed, it was on account of the extreme rarity of this intermediate form that the older naturalists failed to recognize that levana and prorsa were only different forms of the same butterfly.

Dorfmeister ('64) showed that if chrysalids which were naturally destined to produce the prorsa form be subjected to cold, they will give butterflies which are *not* prorsa but porima, and that if the cold is as intense as 0°C. the butter-

flies which issue are hardly distinguishable from typical levanas. Later in 1875 Weismann repeated these experiments with the same result. He also tried the reverse experiment. That is, he took chrysalids of the last summer's brood of butterflies and subjected them to the heat of a green house, varying from 15°-31°C. The chrysalids however remained over winter and produced levanas the next spring just as they normally would had they been exposed to the winter's cold. Weismann was deceived by this experiment, and lead into the false conclusion that it was impossible for heat to cause chrysalids destined to produce levanas to give rise to anything but levana. In 1895, however, he published a paper in which he acknowledges that heat can cause the chrysalids which are naturally destined to produce levana to give rise to butterflies of the porima, or even of the prorsa type. His final conclusions ('95 p. 644) are as follows: levana and prorsa follow each other in a regular cycle, levana appears in April, prorsa in June. By the influence of cold chrysalids destined to give rise to the prorsa form can be changed into levana.

This change is not accomplished however without resistance, for the chrysalids show a strong tendency to produce prorsas, as is seen by the production of many porimas among the butterflies whose chrysalids have been subjected to the cold. On the other hand the third, or autumnal, generation of chrysalids shows a strong tendency to over-winter and produce butterflies of the levana type next spring. Heat of 27° - 30° C., can, however, counteract this tendency and cause some of these chrysalids to give rise to porimas, or even to prorsas.

In (1875-'82) Weismann was lead into the conclusion that levana represents the more primitive or ancestral form of the butterfly which existed in Europe at the time of the glacial epoch. As the mean temperature at that time was much lower than at present, and the summer was short, the butterfly was probably single brooded, and consisted of only the form levana. The form prorsa, however, gradually made its appearance after the glacial epoch when the climate became milder, and the butterfly began to produce summer generations. The form prorsa, according to this hypothesis, is phylogenetically newer than levana, and the application of cold simply causes it to revert to its ancestral type. The levana form, on the other hand, could not possibly be made to revert into prorsa because prorsa is phylogenetically younger than levana. In 1895, however, Weismann finds that he is mistaken in this for, it will be remembered, he succeeded in forcing chrysalids which were naturally destined to

produce levana to give rise to prorsa by subjecting them to a high temperature. He is therefore obliged to modify his former (1875-'82) conclusions, and finally decides that there are two kinds of seasonal-dimorphism; one of which he calls "direct seasonal-dimorphism," and the other "adaptive seasonal-dimorphism." By "direct" seasonal-dimorphism Weismann means the direct effect of the temperature stimulus upon the pupae at the time when the colors are produced. This direct influence may induce chemical changes, etc., which determine the coloration of the wings. An excellent example of direct seasonal-dimorphism is afforded by *Chrysophanus phleas* where heat causes the pupae of any brood to give rise to dark colored butterflies; while cold induces them to give light golden red forms.

In "adaptive" seasonal-dimorphism, on the other hand, we have the additional factor that one or both of the dimorphic forms possesses a peculiar advantage correlated with the season in which it occurs. Under these circumstances there has arisen, through the agency of natural selection, a tendency to produce different forms in the different seasons. For example we find inherent in the pupae of *Vanessa levana-prorsa*, two separate, and distinct, tendencies; the one to produce levana, and the other prorsa. The tendency to produce levana is strong in the over-wintering pupae, while the tendency to produce prorsa is strong in the summer pupae. These tendencies can however

be altered by temperatures which are the reverse of the normal ones to which the pupae would be subjected in nature. Cold is only the initiatory stimulus for the levana tendency, and heat for the prorsa tendency. An example of adaptive seasonal-dimorphism may be afforded by *Vanessa levana-prorsa* where the summer form prorsa may gain some advantage by its general resemblance to *Limenitis sibylla* and *camilla*; while it is possible that the overwintered form, levana, may gain some advantage from its resemblance to the dead leaves of the spring woods.

We shall now describe a few more experiments the bearing of which will become apparent when we discuss the results of the researches.

In 1875, '77, '80, Edwards performed some interesting temperature experiments upon *Papilio ajax*. There are four generations of *Papilio ajax* in West Virginia, three being summer generations, and one which winters over in the chrysalis state, and may produce two distinct forms of butterflies, walshii and telamonides. The summer generations are all alike and belong to the form marcellus. The eggs laid by the spring forms usually change into pupae from which the summer form, marcellus, emerges; some of these pupae, however, winter over and produce walshii or telamonides the following spring.

Edwards subjected the pupae reared from eggs laid by captive females of walshii or telamonides, to the cold of an ice house for periods varying from 11

days to 2 months. These pupae would normally have produced only marcellus, but owing to the influence of the cold, the majority of them gave rise to butterflies colored like telamonides. A few, however, defied the cold and remained marcellus, and still fewer were converted into the coloration of walshii. Edwards also tried the reverse experiment, that is he subjected the overwintering chrysalids to the heat of a green house, but they gave rise to telamonides and walshii just as they normally would had they been exposed to the winter's cold.

But by far the most remarkable experiments upon the effects of temperature which have been performed thus far, are those of Fischer ('95) upon *Vanessa antiopa*. When the pupae of this form are placed upon ice at 0-1° C. the butterfly is greatly modified. The ground color is a darker velvet brown than in the normal antiopa, and the blue spots are greatly enlarged, and changed into an intense violet-blue. Fischer describes this form in the "Gubener entomologischer Zeitschrift as *V. antiopa artemis*. A temperature of 35° C., however, produces a form which is exactly the opposite of that produced by cold. Fischer describes it in the "Gubener entomologischer Zeitschrift, July 1894" as *V. antiopa, aberratio epione*. The ground color is lighter than the normal, and the blue spots much reduced in size. But the most astonishing result obtained by Fischer came from experiments with abnormally high temperatures. He subjected fresh

pupae for about three hours, and then daily for 2-3 hours to a temperature of 40°-42° C, keeping them during the remainder of the time at 35°-38° C. The results were very striking and similar to those obtained from pupae

kept on ice at from 0°-1° C; indeed among these specimens he obtained a typical aberratio artemis. The blue spots were much enlarged and the ground color much darkened.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—II.

BY ALBERT P. MORSE, WELLESLEY, MASS.

11. ARPHIA Stal.

Arphia Stal 1873. Recensio orthopterorum, i, 113.

16. *Arphia xanthoptera* Germ. Figs. 16, 16a.

Oedipoda xanthoptera. Germar, in Burmeister's Handbuch der Entomologie, ii, 643, (1838). Scudder, 469; Smith, — Conn., 372.

Tomonotus xanthopterus. Thomas, 105.

Arphia xanthoptera. Saussure, 67; Fernald, 39; Morse, 105; Beutenmüller, 297.

This species is perhaps the *Locusta sulphurea* of which Harris speaks as occurring in September.

Antenna: ♂, 10-11; ♀, 9-11.5. H. fem.: ♂, 14.6-17.3; ♀, 17-18.5. Teg.: ♂, 22.5-27; ♀, 26.5-30. Body: ♂, 21-25; ♀, 28-32. Total length: ♂, 30-34; ♀, 34.5-40 mm.

While most likely to be confused with its congener if any, this locust should be readily distinguished even by the tyro by the characters indicated in the Key, which are not merely specific

in value but pertain to different series in the genus. While the two species overlap slightly in season *sulphurea* has mostly disappeared at the time *xanthoptera* begins to be common.

This species varies much in color, some specimens being almost black, others bright reddish or yellowish brown. The wings of younger examples are noticeably paler in color but the general tint of a large series is quite uniform. Sometimes the veins, and rarely the venules of the whole disk, are somewhat suffused with brownish. In about one-fifth of the specimens examined the subfrontal shoot extends one-half of the distance to the base of the wing. I have yet to see an orange winged example from New England, but in a series collected for me at Clay City, Ill., by S. W. Denton, about one-half of the specimens have the disk of the wing of a deep reddish orange. It is possible that this is a distinct race or even species but the structural differences are extremely slight.

Xanthoptera is equally common with its congener of the spring-time and is found in the same situations, viz., amid

grass and low bushes in barren fields and pastures on dry, upland soil. It is rather shy, flies readily and strongly, and will give the collector plenty of exercise in the warm days of September. Its rattling stridulation is somewhat louder than that of *sulphurea*.

My earliest captures are on July 30, latest on Oct. 30. I have specimens from Wellesley and vicinity, Dedham and Belmont (Maynard), Mass.; Wickford, R. I.; Thompson, So. Kent, New Haven, Greenwich and Stamford, Conn. Scudder reports it from middle New Hampshire, and Henshaw has taken it on Nantucket.

17. *Arphia sulphurea* Fab. Fig. 17.

Gryllus sulphureus. Fabricius, Species insectorum, i, 369, (1781).

Locusta sulphurea. Harris, 177.

Oedipoda sulphurea. Scudder, 470; Smith, — Me., 151, — Conn., 372.

Tomonotus sulphureus. Thomas, 105.

Arphia sulphurea. Saussure, 71; Fernald, 39; Morse, 105; Beutenmüller, 296.

Antenna: ♂, 6-7.5; ♀, 6-7.5. H. fem.: ♂, 11-12.5; ♀, 13.5-15.2. Teg.: ♂, 17.5-20; ♀, 20.5-23. Body: ♂, 17-19; ♀, 26-28. Total length: ♂, 23-26.5; ♀, 28-30 mm.

This species is not likely to be mistaken for any other save its congener, from which it may be readily distinguished by the Key. It is usually paler

in color than *xanthoptera*, especially the ♀, which is sometimes pale yellowish brown. Both sexes are apt to become darker with age. A ♂ from Thompson, Ct., has a large part of the hind margin of the tegmina very pale, contrasting strongly with the general color, a peculiarity often seen in western species of the genus.

This very common and widely distributed locust is found nearly everywhere in dry pastures in spring and early summer, its rattling stridulation being one of the constant features of a ramble in such places at that season. Its flight, particularly that of the ♂, is less extended than that of *xanthoptera*, being often limited to a few feet but sometimes continued for three or four rods; its course is often circling, with an abrupt curve and a sudden drop into the grass and bushes at the end.

Adults begin to appear about the middle of May — my earliest capture is the 19th; it is common in June and early July and scattering individuals may be found even in early September.

It is found throughout New England. I have examined specimens from Norway and Deering, Me.; Berlin Falls (Henshaw) and Hanover, N. H. (Weed); Brattleboro, Vt. (Mrs. J. B. Powers); Wellesley and many towns in its vicinity, Winchendon, Wood's Holl, West Chop, M. V., Mass.; New Haven, No. Windham, So. Kent, Stamford, and Thompson, Ct.

NOTES ON NEW COCCIDAE.

BY T. D. A. COCKERELL, N. MEX. AGR. EXP. STATION.

I. A NEW COCCID PEST OF GREEN-HOUSES.

Yesterday (Feb. 12), in the greenhouse of the N. M. Experiment Station, Prof. Geo. Vestal directed my attention to some small ornamental plants, which were swarming with a scale-insect. The plants had been received from the Colorado Experiment Station, and were not noticed to be infested on arrival; but they must have had some of the Coccids upon them at the time. The name of the plant is given to me by Prof. Vestal as *Pilea arborea* or *filosa* (it is not at all pilose), but I do not find these names in the Index Kewensis.

I recognised at once that the Coccid was new to this country, but I quite expected it would prove to be Newstead's *Lecanium minimum*, described from hothouse plants in England. However, to my surprise, it is quite distinct, and new, so I describe it herewith.

Lecanium flaveolum, n. sp. ♀ Scale (gravid) just 2 mm. long, less than 1 mm. broad, fairly convex, tolerably shiny, light yellow, with the black eyes conspicuous. It is like a very small pale *L. hesperidum*, but narrower. A little spot of white secretion at each stigmatal incision. Parasitised scales turn black. Half-grown examples are delicately reticulated with pale brown lines.

The insect is viviparous, and the newly-hatched young are very pale pink.

♀ Adult, boiled in caustic soda, turns pinkish, but the skin is colorless. Dermis not at all reticulate or tessellate. Antennae very pale, slender, 7-segmented, the segments very distinct, 3 longest, but 4 nearly as long; then 2 and 7 equal in length, obviously shorter than 4; then 1, then 5, then 6, a lit-

tle shorter than 5. 5+6 not as long as 4. Formula 34 (27) 156. 2 and 4 each with a conspicuous pair of bristles near the end, 1 also with a pair, but further apart; 5 and 6 each with a conspicuous bristle; 7 with many bristles, one at its tip about as long as itself. Legs small and pale; tarsus about or nearly $\frac{1}{2}$ length of tibia; tarsal digitules long, slender but of more than filiform thickness, with small but very distinct oblique knobs; digitules of claw extending considerably beyond tip of claw, fairly but not very stout, with large knobs. Trochanter with a very long hair, tibia with a conspicuous bristle on inner side near end. Anal ring with only four hairs, these very long and quite stout. Anal plates rather long and narrow, their outer sides about equal, three bristles at hind tip. Stigmatal spines brown, in threes, one very long and stout, the other two minute and narrow-conical. Margin with rather numerous long slender spines, which are blunt at tips.

Hab. On stems of *Pilea* in greenhouse of N. M. Agricultural Experiment Station, Mesilla Park, N. M.

L. flaveolum differs from *maculatum*, Sign., in being narrower, and entirely lacking the dorsal row of spots which gave the latter its specific name. It differs from *minimum*, Newst., by the dermis being not tessellate, the second segment of antenna being much longer, the 7th not so long, and conspicuously shorter than 3, the tarsi conspicuously shorter than tibiae, the digitules longer than in Newstead's figure. It differs from *rubellum*, Ckll., by its dermis not being crowded with gland-spots, its claw-digitules not or hardly bulbous at base, and the longer 4th segment of antenna. It differs from *nanum*, Ckll., by the longer tarsal digitules,

the much longer 4th antennal segment, and the quite large marginal spines. None of these similar species have been found in the U. S.

2. A JAPANESE COCCID QUARANTINED AT SAN FRANCISCO.

Leucaspis japonicus, n. sp. — ♀ Scales numerous on the twigs, pyriform, about the form of *Mytilaspis pomorum*, but somewhat smaller, whitish with a strong greyish-ochreous tinge, exactly the color of the twig on which they rest; exuviae strongly contrasting, dark chestnut color. The second skin is large and narrow, only slightly overlapped by the first.

♀ Elongate, after boiling in soda pale orange-yellow; four well-developed lobes, similar in form, but the second smaller than the first, all about as far apart as the breadth of a median lobe, trilobed, the median lobule largest, the others very distinct and somewhat spreading. The wide areas between the median lobes, and between the first and

second, are each occupied by a pair of deeply bifid plates, which do not extend to the level of the ends of the lobes. The margin cephalad of the second lobe is gently crenate, the low broad elevations resulting, about seven in number, being armed with three or more minute spinules, really rudimentary plates. Surface of hind portion conspicuously striate, anal orifice a long distance from hind end, no groups of ventral glands, but numerous large transversely elongate scattered glands. The whole lateral margin of the abdominal portion of the insect presents a thickened striate edge, with broad serrate chaff-like scales at very frequent intervals.

Hab. — On broom from Japan, found Dec., 1896, by Mr. Alex. Craw in the course of his horticultural quarantine work at San Francisco.

Note. — Since the above was written, Prof. Gillette has found the *Lecanium flaveolum* at the Colorado College. The proper name of the plant, according to Mr. Cowen, is *Pilea microphyllum*. — T. D. A. C., March 2.

THE LARVAL STAGES OF ARCTIA ANNA GROTE.

BY HARRISON G. DYAR, NEW YORK, N. Y.

Eggs were obtained from a female moth of the *persephone* form at Greenwood Lake, N. J., in June.

Egg. Neatly conoidal, the base flat and concave; pale yellowish white, shining; the reticulations very fine, broad, not sharp, rounded, the areas between forming shallow indistinctly margined pits; height, .6 mm., diameter .9 mm.

Stage I. Head bilobed, the lobes dark blackish brown, clypeus pale, whitish; width .4 mm. Cervical shield narrow, dusky; body whitish, with long, stiff, dark setae; warts pale; later both warts and leg-plates shining dusky gray, large. Setae normal, the subprimaries absent, but wart iii on the abdomen bears two hairs, including the large

subdorsal wart on joint 13 which has four hairs. At the end of the stage the appearance is whitish, the segments faintly brown dotted, not distinctly banded, the warts dusky, not contrasting.

Stage II. Head bilobed, the lobes shining blackish, clypeus pale; width .55 mm. Body whitish, shaded with red-brown around the dusky warts, giving the appearance of longitudinal bands, especially a pale dorsal line. Warts hairy, normal, large except i which is very small and vi which is moderate. Hairs stiff, black, a few longer ones posteriorly from the subdorsal wart on joint 13. After eating, the body becomes sordid greenish, the larva consequently appearing dark.

Stage III. Head shining black, the cly-

peus pale yellowish; width .7 mm. Body thick and robust with large black warts, grayish, brown mottled, no marks except a faint, pale, dorsal line. Hair abundant, stiff, bristly, barbed coarsely, black, a few longer hairs posteriorly. Later there is a faint wavy white subdorsal line below wart ii.

Stage IV. Lobes of head shining black, clypeus pale yellowish; width 1.1 mm. Body blackish brown, not so dark as usual, no marks except a very faint paler straight dorsal and a lateral line (below ii). Warts shining black, faintly pale ringed at the base. Hair as before with the addition of two very long slender white hairs from joint 13. Later the pale marks around warts iii are faintly reddish.

Stage V. Head pale brownish, a black shade on each lobe in front, mouth brown, eyes large, black; width 1.55 mm. Body black, the warts shining, large with stiff black hairs, a pair of long (12 mm.) white ones posteriorly. No distinct marks; a faint whitish dash below wart iii, fine pale dorsal and subdorsal (below ii) lines; lateral area paler than the dorsal, the bases of warts iii to v slightly reddish.

Stage VI. Head shining black, bases of antennae and line above mouth whitish; width 2.2 mm. Body all black, velvety; warts shining, the bases of ii to iv faintly reddish under a lens, no marks visible to the unaided eye. Hair bristly, deep black, barbed, some longer ones posteriorly, but all alike black. Tips of feet pale.

Stage VII (interpolated). Head black, the sides, clypeus, sutures and mouth more brownish; width 2.5 to 2.7 mm. Body black, the basal rings of the warts dull luteous, warts shining, no other marks. Hair very coarse with barbules as before.

Stage VIII. Head as in stage vi, width about 3 mm. Body and hair black, the bases of the warts shining, the ends of all the feet pale; no marks. The back and sides of the head are brownish and later the antennae and line above the mouth becomes pinkish.

The larvae hibernate in this stage. The growth is slow. The eggs hatched toward the end of June, the last molt took place between August 24th and September 12th in different larvae and hibernation began soon afterward.

Food plants various low plants.

PINK LOCUSTARIANS.

A SPECIMEN of *Amblycorypha oblongifolia* of a vinous color was sent me in 1886 by Mrs. Sidney I. Smith who took it Aug. 9, at Woods' Holl. It was dead when it reached me but had been kept alive some time. All the green parts including both tegmina and wings were tinted of a uniform color except that the thickened green flecks of the normal tegmina and the lateral carinae of the pronotum were fuscous. So too were the eyes, but the antennae, except the extreme base, were luteous like the ordinary form. The specimen was a ♀ and the color extended to the ovipositor of course, the denticles of which were fuliginous.

Two other specimens (♂ ♀) of the same species were also taken at the same place by Mr. Richard Rathbun and Prof. A. E. Verrill on Aug. 29, 1886, and were examined while still living. The ♀ is of a pale coral red verging on magenta, the abdomen a shade paler, while the ♂ is of an orange red. The tegmina of the ♀ are of a very clear color with scarcely a single fleck of brown while those of the ♂ are much dotted (for *Amblycorypha*) with brown and longitudinally flecked with yellow, while the stridulating field is almost entirely dull brown, and an obscure patch of the same color more distinct on one side than the other appears near the middle of the outer half of the tegmina near the upper margin. In both the palpi are of the color of the body, but the eyes are green and the antennae of the normal luteous. The lateral carinae of the pronotum are luteous in the ♀, fuscous in the ♂.

They devour the flowers of golden rod and clover etc. with great zest.

All parties at Woods' Holl during the season insist upon it that they had no temperature at all approaching the freezing point.

I described (*Psyche* ii, 189) a similar specimen of *A. rotundifolia*—published in Dec., 1878; and Brunner speaking of the same species in his *Monogr. der Phaneropt.* (p. 269) says one Pennsylvania specimen has violet tegmina. He also gives instances of similar variation in other Locustarians. Lewis gives an instance of the same peculiarity in *Cyrtophyllum concavum* (*Proc. Acad. nat. sc. Philad.*, 1883, 44). *Samuel H. Scudder.*

MCNEILL ON TRYXALINÆ.—The Davenport academy of natural sciences has just published, in an octavo pamphlet of 96 pages and six admirable plates, Prof. J. McNeill's Revision of the Tryxalinae of North America. It is one of the most important pieces of recent work done on North American Orthoptera by American entomologists; for the Tryxalinae have been one of our least known though richest groups. The classification is an independent one and does not follow very closely the features of Brunner's general outline for the Tryxalinae of the world given four years ago, and which contained a relatively small portion of the genera here recognized by McNeill. Altogether 75 species are entered, referred to 31 genera, of which 11 are proposed as new. Only ten new species are described, which is an astonishingly small number for the country, since several new forms have been found in the East within recent years, and a great deal remains to be done even here. A full figure, generally with considerable additional detail

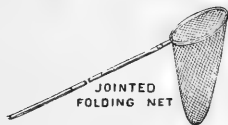
is given for every genus, but unfortunately the enlargement above nature is not indicated. The memoir places our small grasshoppers on a very different basis from that on which they have hitherto stood, and the figures alone are a striking addition to our means of study and determination.

A GENUS OF GRYLLIDÆ HITHERTO UNRECORDED FROM THE UNITED STATES.—I have recently received from Mrs. Annie Trumbull Slosson specimens obtained in southern Florida of a new species of *Mogoplistus*, which may be called *M. slossoni*.—It differs from all known species in its long pronotum, which is considerably longer than broad, a little broader posteriorly than anteriorly, the lateral cantli rounded, the posterior margin truncate, straight, the lateral lobes equally rounded anteriorly and posteriorly; the first joint of the hind tarsi is elongate and much more than twice as long as the hind tibial calcaria; the ovipositor as long as the hind tibia and tarsi taken together. The body is covered with gray scales, beneath which the thorax is testaceous and the abdomen black; the central portion of the outer face of the hind femora is also black; antennae castaneous. Length of body, ♀ 7.5 mm; ovipositor, 5 mm. Biscayne Bay, Fla., under bark of trees.

Mrs. Slosson writes that they are silvery and iridescent in life, and very agile and were found wherever she tore off bark from fallen trees.

The genus has been heretofore known in America only from Chili, the species from Cape St. Lucas Lower California referred here (*Mogoplistes*) by me belonging elsewhere. *Samuel H. Scudder.*

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PSYCHE.

A NEW HYPOTHESIS OF SEASONAL-DIMORPHISM IN LEPIDOPTERA. — II.

BY ALFRED GOLDSBOROUGH MAYER, CAMBRIDGE, MASS.

(2) *New Hypothesis of Seasonal-Dimorphism.*

I know of only one experiment upon the effect of *excessive* heat upon Lepidoptera, and that was performed upon the pupae of *Vanessa antiopa*, by Fischer ('95) who, it will be remembered, subjected them, when fresh, for 3 hours and then daily for 2-3 hours to a temperature of 40°-42° C. keeping them at all other times at 35°-38° C. The butterflies which issued resembled those which would have resulted from exposure to cold of 0°-1° C.

It has occurred to me that in this remarkable fact we may have a clue to at least a partial explanation of the action of cold upon seasonally-dimorphic Lepidoptera. It is well known from the researches of Dutrochet, Rossbach, and Plateau that if organisms be subjected to gradually increasing heat the metabolic processes as evinced by increased excretion in protoplasm, and more rapid rate of development, become more and more active; until suddenly all movements cease and heat rigor sets in. This is not death however for if the organism be now cooled down, recovery takes place, and the life processes return

with normal vigor. According to Plateau* the temperature of heat rigor in various insects varies between 38°-43° C. It is highly probable then that the high temperature of 40°-42° C. produced *heat rigor* in the pupae, and therefore the metabolic processes were checked, exactly as they would have been by the benumbing influence of cold. If this be true it becomes probable that the peculiar color-aberrations caused by cold are only an expression of the *decreased metabolism* in the pupae. It will be remembered that heat of 35° C. produces an aberration in *V. antiopa* which is just the reverse of that caused by cold. In this case the peculiar coloration could be explained as one of the results of the increased metabolism in the pupae.

Now it may well be that it is an advantage to a pupa which is destined to withstand the winter's cold to *inherit* a tendency toward a low metabolism, for resistance to the cold would naturally require the possession of low metabolic processes; hence those pupae which already possessed low metabolism would

*Plateau, '72; Bulletin d'Academie royale des sciences de Belgique, xxxiv, pp. 315-317.

be in better condition to withstand the effects of the cold. Natural selection would then operate to weed out all pupae having high metabolic processes, for they would be more likely to freeze; whereas those individuals in which the metabolism was low would be preserved. Also this inherited tendency in the overwintering pupae to possess low metabolic activity might become so strongly fixed that it would be found difficult to alter it by the mere subjection of the pupae to a high temperature, such as 32°-35° C. Moreover it would doubtless be of advantage to the insects if they had the power to resist the influence of such warmth, for there are often hot periods of weather in the autumn through which the overwintering pupae must pass; but their development must not be hastened thereby, for if the butterflies emerged they or their progeny would probably perish of the cold.

Professor Weismann's former (1875, '82) idea that in the seasonally-dimorphic butterflies of the temperate zone the phylogenetically older form issues from the wintered chrysalids, and represents the form which existed during the glacial epoch, is to my mind improbable. His hypothesis may be true as far as the European *Vanessa levana-proorsa* is concerned, because, as is well known, the butterflies of Europe are more closely related to those of Siberia, than to those of Africa or India. (See Bath ('95)).* The cause of this lies

in the well known fact that there has been, according to Geikie, no land connection between Europe and Africa since the close of the glacial epoch. Moreover the deserts of Sahara, and Arabia, and the snow clad peaks of the Himalayas form an insuperable barrier beyond which tropical forms could not pass to enter the northern regions. In America, however, the case is very different, for almost 50% of all the known species of Lepidoptera of the world come from South America,* and there can be but little doubt that the ancestors of most of the North American butterflies came from South America. The ancestors of the North American forms have gradually crept in from South America after the glacial epoch, and as their range extended further and further north, they were obliged to become adapted to the cold, or perish. This adaptation would mean the acquisition of a low metabolism in the *overwintering* pupae. In this connection it is interesting to notice that Merrifield ('93) has shown that in England those pupae of *Pyrameis atalanta* which form in the autumn all perish of the cold. This insect usually hibernates as an imago, and is not seasonally-dimorphic. Indeed, the seasonally-dimorphic butterflies, of the temperate zone, according to Scudder (Butterflies of New England, 1889, p. 1384) probably all *winter*

* Bath, W. H. 1895; Entomologist Vol. 28, p. 247.

* Schatz ('92) finds that there are in South America 272 genera of butterflies comprising 4560 species, and that 231 of these genera are proper to South America alone. In North America, on the other hand, there are according to Edwards only 66 genera and 612 species.

over as pupae. Dr. Scudder has also observed, that in a few cases of seasonal-dimorphism we find differences between the earlier and later appearing members of the spring brood, the later members showing an *approach toward the summer form*.

It is highly probable that the vast majority of Lepidoptera which existed in North America before the glacial epoch, simply retreated southward upon the approach of the ice. For to have them remain we are obliged to assume that not only they, but their food plants, also, became acclimated to the cold. Many of those which did remain, and succeeded in defying the cold would probably for the most part become so thoroughly acclimated to it that they would finally *prefer* a cold climate, and when the ice retreated they would probably follow it northward leaving a few representatives stranded, as it were, upon the tops of the highest mountains; as has been shown by Grote and, also, Scudder ('89 p. 588) to have been the case with *Oeneis semidea* of Mount Washington.

In the case of *Papilio ajax*, which was experimented upon by Edwards, I have reason to believe that it could not have existed in North America during the ice period. For its nearest allies are all in Mexico, and South America, none of them being found in the colder parts of North America. Moreover its food plant, the papaw (*Asimina triloba*, Dunal.) belongs to the characteristically tropical family Anonaceae, and cannot live in a cold climate. This leads me

to suggest that *walshii* or *telemonides* are not primitive forms as would be the case were Weismann's 1875 hypothesis true. I also predict that if the overwintering pupae of *Papilio ajax* be subjected to a constant heat of from 30°-35° C. they will be transformed into the summer form *marcellus*.

Conclusions: In lepidoptera of the temperate regions it is an advantage for the summer pupae to possess *high* metabolic processes, for under these circumstances their development is rapid. On the other hand it is an advantage for the overwintering pupae to possess *low* metabolic process, for under these circumstances they would be the better able to withstand the influence of warm periods of weather in the autumn; for if the butterflies emerged at this time they or their progeny would probably perish of the cold. Moreover in order that the pupae may withstand the influence of the winter's cold it is essential that they possess a low metabolism. Natural selection would then operate to cause all summer pupae to *inherit* a high metabolism, while all overwintering pupae would be forced to *inherit* a low metabolism. Pupae which possess a constitutional tendency toward high metabolism give rise to the summer form of imago, while those pupae which possess a constitutional tendency toward low metabolism give rise to the overwintered form of butterfly. The summer and winter forms of imago are only expressions of this difference in constitution of the summer and winter pupae.

It is well known through the re-

searches of Barker,* Brandes,† Butler,‡ and others that tropical butterflies exhibit seasonal dimorphism. It has occurred to me that this may possibly be due to the direct influence of the varying humidity upon the pupae. Pupae reared in a dry atmosphere may give rise to the dry season form, while those reared in a humid atmosphere may give rise to the wet season form. I am assured by Mr. E. A. C. Olive of Cooktown, Queensland, Australia that the development of pupae in that region is more rapid in the wet season than in the dry.

I freely admit that Weismann's "adaptive" seasonal-dimorphism may exist, but I believe that the explanation given in this paper is more probable. I hope that some of the many able entomologists who are carrying out researches upon seasonal-dimorphism will test its truth or falsity by experiment.

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ON MOUNTING MINUTE INSECTS. PARTICULARLY
MICRO-DIPTERA.

BY CARL F. BAKER, AUBURN, ALA.

There has been, in the past, a great lack of uniformity in the mounting of minute insects. I believe the subject one demanding the earnest attention of collectors. Probably nothing adds more to the appearance of a collection than a uniform style of mounting, and also, nothing is more difficult to maintain (under the present order of things) in the building up of a large collection by accessions from other collections. Further, the usefulness of what is intended for a working collection depends almost entirely on the manner of mounting. In a lot of minute insects recently received from Europe, over a dozen different styles of mounting (all on pins) were represented, and not one was adapted to a rapid and satisfactory examination of the insect. For certain very essential characters remounting was necessary.

In Coleoptera, Hemiptera, and Hymenoptera, during the past few years, the mounting has become much more uniform in this country, the triangular slip of cardboard being used almost exclusively. Unfortunately there has been the greatest variation in size of slip, and manner of placing specimen on same. The most satisfactory size and shape seems to be that recommended by Riley, and I believe this should be adopted by all American col-

lectors. With a little practice these can be very rapidly cut by hand from strips of cardboard of the standard width. In hand cut slips there will be a very convenient variation in size of point. With the slips should be used *at least* a No. 2 pin — preferably Klaeger. There is nothing gained by the use of very slender, easily bent pins, and they are extremely exhausting to the patience. So trying to me are these very slender pins that I never use them except with Micro-lepidoptera, to stick into pith mounted on a heavier pin.

Holding the pin in the hand, slip pointing to the left, the mounted insect should always have the head directed away from the operator, and be evenly saddled on the extreme point of the slip, at right angles to both slip and pin. Specimens are usually better mounted with the back straight up, the slip point glued to one side of the ventral surface. This will allow a ready examination of any portion of the body with a $\frac{1}{2}$ or $\frac{2}{3}$ objective, provided the standard length of slip is used. If a good glue (like fish-glue) of the right consistency is used there will be no trouble with specimens falling off. A moderately thin solution of white shellac in alcohol has best served my purposes. It should be remembered that the most important characters in

Coleoptera are ventral, in Hymenoptera dorsal, and in Hemiptera both dorsal and ventral.

Not only has this method been found to answer every purpose (both as to utility, and beauty also — if neatly done) in connection with the preservation and study of material in Coleoptera, Hemiptera, and Hymenoptera, but it is a far more rapid method for the minute things than any other, and American workers have no time to waste. I would like to ask why this method cannot be used for Micro-diptera? I can see nothing to be gained by adhering to the old methods of pinning, that in which the cork and pith blocks are used requiring the expenditure of too great an amount of time. Up to a very recent date most dipterists have insisted that it was absolutely necessary to pin all Diptera, yet in no case at hand can I find a good reason given. On the contrary one of our best dipterists lately informed me that in future he wished the micros all mounted on slips.

I use the moderately thin shellac glue and have had no trouble with specimens falling off. On the other hand, specimens on the little pins in pith often come loose and swing about, standing at all angles and ruining the appearance of the collection. Not only is there a great saving of time in mounting on slips, but there is far less injury to the specimen than in pinning, and it is much more readily manipulated under the microscope. I have used this method in my own collection for some time and think myself justified in recommending it to American collectors, though it would undoubtedly horrify our patient and long-suffering European brethren. Many of us would be very glad to hear from the dipterists regarding this matter. However, before any definite opinion is rendered, specimens correctly mounted by this method should be carefully examined. I will gladly loan such specimens from my own collection to any one willing to pay postage on same.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—IV.

BY ALBERT P. MORSE, WELLESLEY, MASS.

12. CHORTOPHAGA SAUSS.

Chortophaga Saussure 1884. *Pro-*
dromus Oedipodiorum, 43, 72.

18. *Chortophaga viridifasciata* DeG.

Figs. 18, 18a.

Acrydium viridifasciatum. De-
Geer, *Memoires d. Ins.*, iii, 498, pl.
42, fig. 6 (1773).

Locusta (Tragocephala) viridifas-
ciata. Harris, 181.

Locusta (Tragocephala) infuscata.
Harris, 182.

Locusta (Tragocephala) radiata.
Harris, 183.

Tragocephala infuscata. Scudder,
461; Thomas, 102.

Tragocephala viridifasciata. Scud-

der, 461; Smith, — Me., 148, — Conn., 374; Thomas, 103.

Chortophaga viridifasciata. Sausure, 72; Fernald, 40; Comstock, 104; Morse, 105; Beutenmüller, 295.

Chimarocephala viridifasciata. Comstock, 98.

A very full bibliography of this species and interesting notes on variation are given by Scudder in Proc. Boston soc. nat. hist., xvii, 481, — also Entom. notes, iv, 80. In coloration, dichromatism, form of head and character of haunts it is intermediate between the present group and the Tryxalinae, with which it was formerly classed.

Antenna: ♂, 6-8; ♀, 6-8. H. fem.: ♂, 10.5-12.5; ♀, 13-15.5. Teg.: ♂, 16.8-20; ♀, 18.6-25. Body: ♂, 17-20; ♀, 22-32. Total length: ♂, 21.5-26; ♀, 26-33 mm.

This is our only species of the subfamily which is markedly dichromatic, presenting two distinct types of coloration, one entirely brown, the other largely green but with a small amount of brown upon the tegmina. These two forms are commonly distinguished by the names *virginiana* for the green and *infusata* for the brown, applied to them by Fabricius and Harris respectively. Specimens are occasionally found which can scarcely be referred properly to either form, the color being a mixture. Rarely, the green is wholly or largely replaced on the head, pronotum and hind femora by pink or reddish purple.

This dichromatism is largely, but not entirely, characteristic of sex; most of the females being green, of the males

brown. Thus of 300 specimens in my collection only about 18 per cent. of the females are brown and 10 per cent. of the males green. This proportion is smaller than that given by Scudder (Proc. B. S. N. H., loc. cit.) but I have no doubt that it is much higher than exists in nature, the common practice of the collector being, naturally, to preserve more examples of the scarcer form. Brown specimens vary much in intensity of hue according to age, those taken in late July and August being notably dark colored.

The hind tibiae differ much in color in different specimens, being variously tinted with brown, blue, pink or purple, without regard to sex.

Harris' name, *radiata*, proposed for examples with infuscated wing-veins and a slight difference in general coloration, does not seem worthy of retention.

This is the most abundant of our springtime locusts. It is widely spread over the country but is found most plentifully in old, grassy, mowing fields and pastures, where it occurs both in the drier and moister portions and is seemingly equally at home in each.

It is readily secured by sweeping. While taking wing readily its flight is short, seldom over a rod or two, and it is not difficult to capture. The male flies in a circling course, and usually stridulates, producing a fine, sharp crepitation; the female flies farther and more directly.

The season in which this species may be found is the most protracted of any locust of the present group. It makes its appearance in April, — I have taken

it on the 24th, but it can probably be found earlier — is abundant in May and June, common in July, scarce in August, and has been taken in Sept., Oct., and Nov. in the adult state. Beutenmüller reports it as double-brooded at New York. The three specimens which I have taken at Wellesley on Nov. 8 and 17 are females in good condition and probably had gained their wings within a short time. The young may be readily found in the latter part of August and during the remainder of the season in the haunts of the adult. On mild sunny days in winter when the ground is bare they may be met with along the edges of woodlands on southward-facing slopes and in sheltered nooks. Here, in company with the young of *H. tuberculatus* and *A. sulphurea*, they may be found hopping gaily about on the approach of a stranger, pattering like hailstones on the dry leaves underfoot.

This locust is doubtless found throughout New England. Smith reports it from Norway, Me. I have specimens from various points in Vt., N. H., Mass., Conn., and from Martha's Vineyard and Penikese Ids. Among these are two worn males from Tuckerman's Ravine on Sept. 6.

13. ENCOPTOLOPHUS Scudd.

Encoptolophus Scudder 1875. Proc. Boston soc. nat. hist., xvii, 478. (Also in Ent. notes, iv, 77.)

10. ENCOPTOLOPHUS sordidus Burm.

Fig. 19.

Oedipoda sordida. Burmeister, Handbuch der Entomologie, ii, 643,

(1838). Scudder, 473; Smith,—Me., 151,—Conn., 373; Thomas, 116.

Locusta nebulosa. Harris, 181.

Encoptolophus sordidus. Saussure, 77; Fernald, 41; Comstock, 103; Morse, 105; Beutenmüller, 296.

Antenna: ♂, 8-9; ♀, 8-9. H. fem.: ♂, 11-12; ♀, 14-15.5. Teg.: ♂, 16-19.5; ♀, 20.5-24. Body: ♂, 19-21.5; ♀, 24-35. Total length: ♂, 21-28.5; ♀, 28-32.5 mm.

This species is easily recognized, not only from the venation of the tegmina, but from its superficial appearance. Though very plentiful in numbers its range of variation is relatively small even in color, the ground tint being either dull rusty, yellowish, or smoky brown.

It is a very common and widely distributed locust and is found most plentifully in the drier portions of old fields and pastures in late summer and fall, at which season the dull rattling of the countless numbers which rise before the feet of the stroller on a sunny day is almost continual. Its flight is but short, seldom more than a rod or two in length. Owing to its abundance it can readily be obtained in numbers by sweeping.

I have taken it on various dates from Aug. 9 to Nov. 17. It is doubtless found throughout New England; I have examples from Fryeburg and Deering, Me.; Hanover, (Weed), and Kingston, (S. W. Denton), N. H.; Brattleboro, Vt. (Mrs. J. B. Powers); Belmont (Maynard), Adams, Wellesley and vicinity, Mass.; Canaan, Greenwich, So. Kent, New Haven, Stamford, and Thompson, Ct.

DESCRIPTION OF SOME NEW GENERA IN THE FAMILY CYNIPIDAE.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

Subfamily iii ANACHARINAE.

ACANTHAEGILIPS gen. nov.

This genus is based upon a single specimen in the Herbert Smith collection, taken by him at Chapada, Brazil. It is closely allied to *Xyalaspis* Hartig, and *Aegilips* Haliday, but is readily distinguished from both by the very large *erect* spined scutellum, the rugose mesonotum which is without parapsidal furrows, the *long* open radial cell, and by the larger abdominal petiole.

Acanthaegilips braziliensis sp. n. ♀.—Length 2.4 mm. Black, shining; antennae and legs brownish-yellow, anterior and middle femora, except at base and apex, brown, hind coxae and femora, except at apex, and hind tibiae, except at base, black; wings hyaline, the veins brown.

The head is perfectly smooth, highly polished; mandibles brownish-yellow, 3-dentate, the teeth black; antennae longer than the body, slightly thickened at apex, 13-jointed, the scape long, obclavate, as long as the second flagellar joint, the first flagellar joint being as long as the pedicel and scape united, the following joints to penultimate gradually shortening, the last joint as long as the two preceding united. Mesonotum coarsely irregularly rugose, without furrows. Scutellum produced into a long erect acute spine the length of the mesonotum. Metanotum rugose with the pleura pubescent. Marginal vein long, open along the fore margin, the second abscissa of radius twice the length of first. Abdomen subglobose, polished, the petiole smooth.

Hab.—Chapada, Brazil.

Subfamily viii CYNIPINAE.

PHYLLOTERAS gen. nov.

This genus is based upon *Biorrhiza rubinus* Gillette, which is quite distinct from *Biorrhiza*

Westwood, in having 13-jointed, *not* 14-jointed antennae, and by having only faint traces of parapsidal furrows.

It comes, however, quite close to the agamous female of *Trigonaspis* Hartig, but the scutellum is rounded, with indications of foveae on either side at base, and without a rim at apex. In *Trigonaspis*, the scutellum is semicircular, without foveae at base and bounded by a delicate rim posteriorly.

In *Phylloteras* the frons is shagreened or coriaceous, the mesonotum subopaque or alutaceous, the antennae rather short, the third joint a little longer than the fourth, joints 9 to 12 twice as long as thick, while the claws of hind tarsi have a tooth at base within. In *Trigonaspis* the frons is smooth, shining, or at the most feebly alutaceous, the mesonotum polished, the antennae with the third joint almost twice as long as the fourth, joints 7 to 12 being scarcely longer than thick, while the claws of hind tarsi are simple, without a tooth.

SPHAEROTERAS gen. nov.

This genus is based upon *Biorrhiza mellea* Ashm., which differs from the true *Biorrhiza* in having no carina on the frons between the antennae, in having only 13-jointed antennae, by the scutellum being rounded, and finally by the hind tarsi being much shorter than the tibiae, the claws having a more or less distinct tooth beneath at base.

In *Biorrhiza* the scutellum is lunate or semicircular, the frons carinate, the hind tarsi as long as their tibiae, while the claws are simple.

TRICHOTERAS gen. nov.

In this genus the antennae are only 12-jointed, the third joint being a little shorter and thicker than the fourth, but of an equal

length with the fifth; joints 6-8 become gradually shorter and shorter, joints 8 to 11 being only a little longer than thick, the 12th or last joint oblong, as long as 10 and 11 united. The head and thorax are closely punctate, opaque, and very hairy, the disk of the mesopleura alone polished and bare; the scutellum is cushion-shaped, a little longer than wide, with two smooth, lunate foveae at base; hind tarsi not longer than their tibiae, the claws with a tooth at base beneath.

Trichoteras coquilletti sp. n. Galls.—Small, brown, subopaque, globular galls, averaging from 6 to 8 mm. in diameter, and internally with a central kernel or larval cell held in place by radiating filaments.

These galls were collected by Mr. D. W. Coquillett, at Los Angeles, Cal., from the upper surface of the leaves of an unknown oak, who forwarded them to the Department of Agriculture, where three specimens of the gall wasp were reared. Structurally and in general appearance the galls very closely resemble *Dryophanta polita* Bass., but the subapterous wasp is quite different from that species.

Gall-wasp. Agamous, ♀. Length 2.5 mm. Head and thorax ferruginous, closely punctate, and very hairy; prosternum and pleura blackish; legs fusco-piceous, the articulations paler.

Antennae 12-jointed, shorter than the body, the scape fully as long as the first joint of flagellum, obconical, and much stouter, pedicel $1\frac{1}{2}$ times as long as thick; second joint of flagellum distinctly longer than either the first or third joint; fourth joint of flagellum a little shorter than the third, the fifth and following joints gradually shortening, the penultimate joint being scarcely longer than thick, the last joint fully as long as the first joint of flagellum, or twice as long as the penultimate. Wings abbreviated, narrowed and not extending beyond tip of abdomen, the veins dark brown, the marginal cell open, the areolet indicated by the union of the surrounding nervures.

Abdomen black, polished, pubescent along the sides towards base, and as long as the head and thorax together, compressed, and viewed from the side it is as broad as long, the hypopygium armed at tip with a long spine.

Hab. — Los Angeles, California.

Type, No. 3498, U. S. N. M.

Described from 3 ♀ specimens, bred Nov. 26 and 29, and Dec. 6, 1892.

AULACIDEA gen. nov.

The type of this genus is *Aulax mulgidiicola* Ashm., and to it belong all the N. A. species recently described under the genus *Aulax*. From *Aulax* Hartig (*sens. str.*) it is readily separated by the closed marginal cell. It is intermediate between *Aulax* Hartig, and *Phaenacis* Förster; from the former, it is at once separated by the character already referred to—the closed marginal cell, while from the latter which also has a closed marginal cell, it differs in having the first abscissa of radius curved, the apical branch of the submarginal vein straight, the parapsidal furrows sharply defined, complete, the female with 13-14-jointed antennae, the third joint being shorter than the fourth or at least no longer. In *Phaenacis* the first abscissa of radius is almost straight, the apical branch of the submarginal vein curved, the parapsidal furrows incomplete or vaguely, indistinctly defined, while the female antennae has the third joint longer than the fourth.

GONASPIS gen. nov.

This genus is based upon *Diastrophus scutellaris* Gillette, and to it also belongs *D. potentillae* Bassett. It is at once separated from *Diastrophus* Hartig, by the shape of the scutellum which is much produced, in outline pyramidal, its tip projecting far over the metathorax, by the lower half of the mesopleura being coarsely sculptured, and by the antennae being 13-jointed in ♀, 14-jointed in ♂. In *Diastrophus* the ♀ has 14-jointed antennae, the ♂ 15-jointed antennae.

GILLETTEA gen. nov.

This interesting new genus of gall-making Cynipidae, which is dedicated to Prof. C. P. Gillette, one of our most industrious students of these insects, is based upon an undescribed species discovered by Prof. T. M. Holzinger, of Winona, Minnesota, living in pithy swellings on the leaf petiole of *Taraxacum dens-leonis*.

It comes very close to the European genus *Xestophanes* Förster, agreeing with it in having a smooth mesonotum, an open radial cell, with a distinct areolet, and well defined parapsidal furrows; but the antennae in both sexes are 14-jointed, the third joint being distinctly longer than the fourth, the scutellum is smooth or nearly smooth, while the metanotum has two parallel, widely separated median carinae. In *Xestophanes* the antennae are 13-jointed in the ♀, 15-jointed in the ♂, the scutellum rugulose, while the metathoracic carinae are not parallel and converge anteriorly.

Gillettea taraxaci sp. n. Galls. — Irregular, knotty-like, pithy swellings, occurring together and uniting and forming oblong, irregular galls along and surrounding the leaf-petiole of *Taraxacum dens-leonis*; average length from one-quarter of an inch to fully two inches.

Gall-wasp. ♀. Length 1.5mm. Polished black, shining; head above, disk of mesonotum and scutellum feebly, microscopically shagreened; face and sides of thorax more distinctly shagreened, subopaque; antennae brown-black, with tip of pedicel and first joint of flagellum honey-yellow; mandibles pale rufous with black teeth, bidentate; all coxae black, the femora brown-black, towards

apex as well as all tibiae and tarsi, honey-yellow, the tibiae medially as well as two or three terminal joints of tarsi, obfuscated; wings hyaline, the veins blackish.

Antennae 14-jointed, nearly as long as the body, filiform, the first joint of flagellum one-half longer than the second, the second about $3\frac{1}{2}$ times as long as thick, the following joints imperceptibly shortening, so that the penultimate is only half the length of the second, the last joint being about one-half longer than the preceding. Parapsidal furrows distinct, complete the middle lobe with a very vaguely defined median longitudinal line, and on either side anteriorly two short vaguely impressed lines, which are only visible in certain lights. Scutellum with two narrow oblique foveae at base. Wings with a short but distinct marginal cilia, the nervures distinct, black, the marginal cell about $2\frac{1}{2}$ times as long as broad at base; areolet small but distinct, triangular. Abdomen not longer than the thorax, polished black, the second segment (the first after the very short petiole) about one-half longer than the third, the fourth and following very short, the hypopygium prominent, as seen from the side, triangularly acute.

♂. Length 1.1 mm. Agrees well with the female, except in the usual sexual differences, the antennae being slightly longer, the third joint honey-yellow only at base; all femora, except the anterior at tips, being black, while the marginal and costal cells are more or less confluent.

Hab. — Winona, Minn.

Types, No. 3499, U. S. National Museum.

Described from 1 ♂ and 2 ♀ specimens, bred March 31, 1896 by Prof. T. M. Holzinger.

LIFE HISTORY OF EUCHAETES EGLIENSIS AND COMPARISON WITH *E. COLLARIS*.

BY HARRISON G. DYAR, NEW YORK.

Egg. Large, rounded conoidal with flat base, very shining, deep ochre yellow; reticulations fine, hexagonal, linear and very obscure; diameter .7 mm., height .6 mm. Laid in patches of considerable size, the several eggs not contiguous.

Stage I. Body pale yellow, warts large, black; feet and shields dark; joints 4 to 6 reddish, forming a band, as also joint 10, but fainter. On prothorax four setae on the shield and one detached, two on the prespiracular tubercle, two on the subventral tubercle; joints 3 and 4 with three setae from the wart ia + ib, one seta from iia, a very fine one from ib, one from iv and two from vi; no subprimary setae on the thorax. On abdomen two setae from wart i, one from ii, two from iii, one each from iv and v, two from the leg plate; the subprimary tubercle vi is present on joints 5, 6, 11 and 12 but bears no seta; vii and viii present on the apodal segments. On joint 13 the subdorsal tubercle (i + ii + iii) bears only four setae. Lobes of head black, clypeus whitish; width .5 mm.

Stages II-IV. As in the mature larva but the hair tufts shorter and smaller, only the dorsal ones (i-iii) with any plumed hairs, consequently appearing less hairy. The youngest ones are a little greenish. Partly gregarious at first, hanging by a thread if disturbed. The habits are much as in *E. egle*. Widths of head .7, 1, 1.5 mm.

Stage V. Head shining reddish orange, paler in the sutures, ocelli dusky; width 2 mm. Body orange red, a shade paler than the head, immaculate. Warts small, neat, black, the hair bunches composed of short spinulated hairs basally, feathery ones centrally, compact, subpencilled, not concealing the body; short and even, 1.5 to 2 mm long, those from warts i and ii on joints 3 and 4

longer, on 4 about twice as long, on 3 three times as long as on the others. Hair all sordid silvery gray; leg plates blackish. Tubercles i to vi normal, iv scarcely smaller than v; four warts on joints 3 and 4; cervical shield and anal plate reduced, represented each by four small warts. Joint 2 slightly retracted, considerably reduced.

Euchaetes collaris has the same number of stages and the same widths of head. The eggs are likewise large, rather hemispherical. In the first stage tubercle i is single-haired throughout, but otherwise the setae are just the same, with the curious non-setiferous tubercles vi on the apodal segments. The head is paler, having only a dusky shade at the vertex of each lobe. In all the subsequent stages the body is whitish and the head silvery gray, the hair tufts spreading, not pencilled, forming an even smooth coat rising about 2 mm. above the back, longer at the ends. The warts are concolorous with the body, not blackish; there are no marks. In habit the larvae differ by their tendency to concealment and are hence less often seen. They feed on the dogbane (*Apocynum*) while *E. egleensis* prefers milk-weed (*Asclepias*).

In previously published accounts of *E. collaris*, Jewett seems to describe four stages and Edwards implies six, but in neither case is the number definitely stated.

BUTTERFLY SOUNDS. — Carl Frings states (*Soc. ent.*, Mar. 1, 1897) that when some bred specimens of *Parnassius apollo* were disturbed, they spread their wings out flat and produced a distinct (recht laut) noise by a forcible and continued grating of the hind tibiae and tarsi against the basal field of the hind wings, which is rather thickly beset with stiff hairs.

OUR GREENHOUSE ORTHOPTERA.

THE following instances of Orthoptera not native to the spot occurring in our greenhouses are the only ones that have come to my knowledge. The first is a *Copiophora* (described as a new species by Thomas) which was found in the greenhouse of the Agricultural department at Washington. Another is a species of *Bliastes*, a single specimen of which did great damage a year or two ago in the orchid house of the Missouri botanic garden at St. Louis, before it was found. Both these genera of Locustarians are strangers to the United States, belonging in tropical America; they were undoubtedly introduced with imported plants. The third case is *Apithes agitatrix* Uhler, one of our southern crickets ranging as far north as Baltimore, which has been found in all stages of development in greenhouses of the Cambridge botanic garden by Mr. J. W. Folsom; it seems to have done no material damage. *Samuel H. Scudder.*

SOME CORRECTIONS IN GENERIC NAMES IN ORTHOPTERA.

IT unfortunately appears that several of the names proposed for new genera in my recent paper on Truxalinae are preoccupied. I, therefore, propose for these names the following substitutes:

Oreina in the key is simply a typographical error, it is written *Opeia* on pp. 214-215 and in the explanation of plate II.

Pnigodes may be *Eupnigodes*.
Eremnus may be *Ageneotettix*.
Plectrophorus may be *Plectrotettix*.
Brunneria may be *Bruneria* as the genus was intended to be named in honor of Lawrence Bruner and was spelled Brunneria by the printer who could not be made to understand that there could be two names so similar as Brunner and Bruner, and as I could not see a second proof, I could not tell whether corrections indicated were made or not. — *Ferome McNeill.*

AULOCARA AND AGENEOTETTIX.

IN a short paper just published (Can. ent., xxix, 75) I have given *Ageneotettix* (*Eremnus* McNeill) as one of the synonyms of *Aulocara* Scudder. In this I was mistaken. The former differs from *Aulocara* in that the prozonal carina is entire, instead of being cut by the transverse sulci; in having the lateral foveolae of the male rhomboidal and subequal in width instead of triangular; and in the much greater inequality in length of the inner apical spurs of the hind tibiae, which latter are also red instead of blue. *Aulocara* has a number of species, some not yet described; *Ageneotettix* extends from Indiana to Dakota in the north and south to Texas and if the forms all belong to one species it is exceedingly varied in size and markings. *Aulocara* extends south to northern Mexico.

Samuel H. Scudder.

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PSYCHE.

E. D. COPE, AS AN ENTOMOLOGIST.

BY C. R. OSTEN SACKEN, HEIDELBERG, GERMANY.

I have just been reading in the papers the sad news of the death of Prof. E. D. Cope, which occurred in Philadelphia a few days ago, and cannot resist the temptation to add my mite of homage, to the many homages his memory will receive.

My acquaintance with Professor Cope was only superficial, but although from a distance, I always was an admirer of his genius.

As a slight *memento* of him I possess a letter which he wrote me, on an entomological question, just 30 years ago. It is so characteristic, especially in the precision and terseness of its expressions, that I deem it worth while to communicate an exact copy of it for publication. The subject is the phenomenon well-known in Germany under the name of "Heerwurm," produced by the larvae of a fly, scientifically called *Sciara*.

Cope was, I believe the first to observe it in the United States, where it has been noticed several times since.

Heidelberg, Germany, April 18, 1897.

Acad. Nat. Sciences, Phila. 12, 27, 1867.

My esteemed friend, R. v. Osten Sacken,

I trouble thee so far as to send some larvae which I take to be *Tipulideous*, but am not sure. — Will thee have the kindness to refer me to the genus or even the species if that be possible in the present state of our knowledge; or to correct me if they not be Tipulidae. — I am publishing in the Pr. A. N. S. some observations on their habits, which are singular. They are subterraneous, but migrate. They are however incapable of progression on the ground, but use each others backs, the hinder walking over the front, while the latter remain quiescent. They thus form an ever moving stream above and solid mass below and seem like a slender slow moving snake. Has such a habit been noticed in any other species, e.g. in Europe? I have not found it. An early reply will be thankfully received by thy friend in the Nat. Sci.

EDW. D. COPE,
Academy N. Sci. Philada.

A NEW SUBFAMILY IN THE JASSIDAE.

BY CARL F. BAKER, POLYTECHNIC INSTITUTE, AUBURN, ALA.

In the National Museum Collection there are several specimens of what is probably the most remarkable Jassoid insect yet discovered in North America. They are from California and were collected by Mr. Koebele. The peculiarities of form and structure are matched by several other Jassoids, its general appearance being that of an Acocephalid, yet the position of the ocelli combined with its other characters, render it unique. For while in general structure it is a Jassid (sens. strict.), yet in the position of the ocelli it is a Bythoscopid, as these organs are well down on the face. But the vertex is thin and foliaceous, somewhat expanded before the eyes, concave above and curved upward, and nearly half again longer than the pronotum, thus removing it far from all Bythoscopid genera. In the passage forward and downward of the Jassid ocellus, this insect might have sprung from the original Bythoscopid root, but its development has certainly been along entirely separate and distinct lines. A more plausible theory is that there was no movement of ocelli except toward each other, the edge of the vertex just above the ocelli becoming extended far forward over them in the form of a thin plate. This is borne out by the fact that the ocelli are still on a line between the upper edges of eyes. This insect is the sole representative of a group

which is further removed from the Bythoscopinæ, than the Ulopinæ and Paropiinæ are from the Jassinæ, or the Ledrinæ from the Tettigoninæ. I name this new genus and subfamily in honor of the discoverer.

Koebeliinæ, n. subfam. Ocelli far below anterior edge of head and distant from the eyes, though on a line between upper edges of eyes. Vertex thin, foliaceous, concave, bent upward, slightly expanded before eyes, and longer than pronotum

Koebelia, n. gen. Head broader than pronotum, vertex half again as long. Ocelli as near to median line as to eyes. Elytra as long as abdomen (exclusive of ♀ genitalia), subcoriaceous, without an appendix. Veins weak; four apical and two antepical cells, basal transverse vein entering radial cell; claval veins two. Type:—

Koebelia californica n.sp. ♀. Length to tip of ovipositor, 7 mm. Light ferruginous, variously clouded with paler. Face above dark, with a transverse angulate lighter line which medially sends three branches to tip of vertex. Vertex with a median lighter area, which is broader anteriorly; extreme anterior edge of vertex dark with fine light interruptions. Pronotum with a median longitudinal light line. Elytra opaque whitish, with three irregular, darker, transverse bands, the first indistinct, the second at middle of elytra, and the third between second and apex. All the veins and margins of elytra with sparse black points.

Vertex broadly subtriangular anteriorly, length three-fourths of breadth between eyes. Front long, narrow, gradually narrowed to clypeus, frontal sutures extending only to

ocelli. Clypeus small, long oval, the pointed end considerably exceeding genae, the latter being extremely narrow below the lorae. Below the eyes the sides of the genae are strongly obtusely angulate, the margin from this angulation to the lorae nearly horizontal. Pronotum short, width two and a half times length, anterior and posterior margins subparallel except at sides. Scutel rather small, shorter than pronotum. Ovipositor longer than rest of venter, exceeding the elytra by

nearly a millimeter. Last ventral segment about as long as preceding, hind margin truncate.

♂. Length 5 mm. Colors very much darker, nearly all below with anterior femora, black; the only light portions of the face being the lines above, and a large area on either side below.

Collected during August in Placer Co., California, by Mr. A. Koebele.

INSECTS COLLECTED AT JACKMAN, MAINE.

BY F. L. HARVEY AND O. W. KNIGHT, ORONO, ME.

In August, 1895, we spent a week in the vicinity of Jackman on the Canadian Pacific R. R. near where it crosses the Maine boundary, and the following insects were taken. We selected what seemed to be a very promising place for sugaring and laid a route nearly a mile long including all kinds of ground. We went over it twice each evening for three nights. The only remarkable thing noticed was the dearth of night-flying insects taken. The fields were alive with locusts and crickets. We were quite surprised to find the chinch bug in dry pastures on the high hills in Moose River township. The locality is fully 300 feet above the drainage of Moose River at Jackman. Moose River, after traversing several lakes, enters the North end of Moosehead Lake. The altitude at which the chinch bugs were found is remarkable, also the locality is nearly 100 miles farther north than Fryeburg, Me., where this insect infests one area covering many square miles.

ORTHOPTERA.

Gryllus luctuosus Serville. Very common under rocks and piles of stones in the fields and pastures. It was by far the commonest insect to be found in the vicinity of Jackman.

Nemobius fasciatus De Geer. Associated with the preceding species but not nearly so common.

Ceuthophilus maculatus Harris. Not very common. A few were found under logs and stone piles.

Scudderxia curvicauda De Geer. Common in bushes and shrubbery.

Xiphidium fasciatum De Geer. Very common in fields and meadows.

Pezotettix glacialis Scudder. Rare. Five specimens were taken in open woods and bogs along a deserted wood road. These were found at an unusually low altitude for this species.

Melanoplus femoratus Burmeister. Common in fields and meadows.

Melanoplus atlantis Riley. Common in fields etc.

Stenobothrus curtipennis Harris.

Stenobothrus curtipennis longipennis Scudd. The above species and subspecies were very common in fields and meadows.

Mecostethus gracilis Scudd. This very variable species was common in the vicinity of Jackman.

Camnula pellucida Scudd. Very rare as only one specimen was taken.

Batrachidea cristata Harris. Very rare, only one specimen was taken.

HEMIPTERA HETEROPTERA.

Pentatoma juniperi Linn. Common.

Blissus leucopterus Say. The chinch bug was common in certain localities in pastures.

LEPIDOPTERA.

Pieris rapae Linn. Very common about Jackman.

Colias philodice Godt. Fairly common about Jackman.

Argynnis cybele Fab. Not common.

Argynnis myrina Cram. Quite common.

Melitaea phaeton Dru. Larvae of this species were very abundant in broods of forty or more on *Chelone glabra*. L.

Melitaea harrisii Scudd. Larvae very common in broods on various species of asters.

Grapta faunus Edw. Common along roads bordered by woods. Next to *Pieris rapae* this was the commonest butterfly seen.

Grapta progne Cram. Rare, only one specimen observed.

Vanessa antiopa Linn. Common.

Vanessa milbertii Godt. Not uncommon.

Pyrameis cardui Linn. Fairly common.

Limenitis disippus Godt. Not very common.

Satyrus alope Fab. Common in moist fields.

Satyrus nephele Kirby. Not very common.

Chrysophanus hypophleas Bd. Imagines very common along roadsides where they were feeding on the honey in the blossoms of May-weed.

Hemaris thysbe Fab. A few of the larvae of this species were seen on *Viburnum cassinoides*.

Sphinx canadensis (?) Boisd. A couple of larvae referred to this species of *Sphinx*, were found feeding on the leaves of blueberry bushes. Unfortunately they were affected by the larvae of some ichneumon fly.

Leucarctia achraea Drury. A few larvae were seen feeding on various grasses.

Platarctia parthenos Harr. A larva which could belong to no other of our Maine species was found, but has since died without going into a cocoon.

Apatela brumosa Guen. Uncommon at treacle. One specimen taken.

Agrotis perconstua Gr. Two specimens taken at treacle.

Agrotis baja S. V. Quite common at treacle.

Agrotis messouria. Quite common at treacle.

Agrotis ypsilon Rott. Common at treacle.

Mamestra picta Harr. One specimen at treacle.

Hadena sputatrix Gr. Common at treacle.

Hyppa xylinoides Guen. A couple caught at treacle.

Apamea nictitans Bkh. Not uncommon.

Apamea nictitans var. *erythrostigma*, Haw. Quite common.

Pyrophila tragopoginis Linn. Fairly common.

Pyrophila pyramidoides Guen. Common.

Eucirroedia pampina Guen. Uncommon.

Catocala concumbens Walk. Three specimens were seen.

Catocala briseis Edu. One specimen seen.

Plusia bimaculata Steph. One specimen taken.

Plusia simplex Guen. One specimen taken.

Drasteria erechtea Cram. Common.

Cleora pulcharia Minot. Fairly common.

Epizeuxis americalis Guen. Common.

Ochyria ferrugata L. One specimen taken.

Depressaria pulvipenella Clem. Common in fields.

COLEOPTERA.

Cicindela 12-guttata Dy.

Cicindela cuprascens Sec.

Dyschirius globulosus Say.

Bembidium bimaculatum Kirby.

Bembidium nigripes Kirby.

Amara angustata Say.

Harpalus autumnalis Say.

Paederus littorarius Grae.

Coccinella transversoguttata Fab.

Tritoma thoracica Say.

Byrrhus americanus Lec.

Buprestis maculiventris Say.

Ellychnia corrusca Linn.

Aphodius fimetarius Linn.

Chrysomela philadelphica Say.

Galeruca tuberculata Say.

Crepidodera helxines Linn.

Ipthimus opacus Lec.

Upis ceramboides Linn.

Tenebrio molitor Linn.

Meloe angusticollis Say.

HYMENOPTERA.

Allantus basilaris Say.

Pompilus luctuosus Criss.

Larra (Tachysphex) tenuipunctus var.

Crabro interruptus Lepel.

Eumenes fraterna Say.

Ancistrocerus catskillensis Sauss.

Vespa consobrina Sauss.

Vespa diabolica.

Vespa germanica.

Vespa maculata.

Andrena nubecula Sm.

Halictus sp.

Halictus paralellus Say.

Bombus asptoni Cri.

Bombus vagans Sm.

Bombus terricola Kirby.

Bombus ternarius Say.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—V.

BY ALBERT P. MORSE, WELLESLEY, MASS.

14. CAMNULA Stål.

Camnula Stål 1873. Recensio orthopterorum, i, 114.

20. *Camnula pellucida* Scudd. Figs. 20, 20a.

Oedipoda pellucida. Scudder, 472 (1862). Smith,—Me., 151,—Conn., 373; Thomas, 137.

Camnula pellucida. Saussure, 81; Fernald, 41; Morse, 105; Beutenmüller, 296.

Antenna: ♂, 7-9; ♀, 6-8.5. H. fem.: ♂, 9.5-12.3; ♀, 11-14.7. Teg.: ♂, 15.5-18.5; ♀, 19-23.5. Body: ♂, 17-21; ♀, 21-28. Total length: ♂, 20.5-24.5; ♀, 22-30 mm.

In the markings of the tegmina, form, and color *pellucida* looks like a diminutive *Hippiscus*, to which genus *Camnula* is not distantly related. It varies much in size and tegminal markings but is not likely to be confused with any other species found here.

It is extremely common, even abundant locally, throughout the northern part of New England, being probably the most numerous in point of individuals of any of our Oedipodinae. It is found in dry, grassy pastures and other untilled lands, preferably on high ground. Its flight is silent or slightly rustling, usually low, short, and direct, resembling that of a large *Melanoplus*; when with the wind, however, it is

occasionally prolonged for several rods in a straight line.

It begins to appear in the winged state about July 1st and may be found during the rest of the season. I have taken it from July 2 till Sept. 6.

I have collected it at Fryeburg, Norway, and on Speckled Mt., Stoneham, Me.; at various points in the White Mts., N. H., including the summit of Mt. Washington; at Jay, Hyde Park and St. Johnsbury, Vt.; at Winchendon, Adams, and on Greylock Mt., Mass.; a single specimen (on a rainy day) at So. Kent, Ct., in the extreme western part of the State, and several at Thompson, in the extreme north-eastern part. In the latter place it was not uncommon in a locality on the north side of a high drumlin a mile east of the village. I have also received it from Hanover, N. H. (Weed); and Florence, Mass. (S. W. Denton).

15. HIPPISCUS Sauss.

Hippiscus Saussure 1861. Rev. et Mag. de Zool., xiii, 398, (1861).

A genus of locusts of large size and robust form represented in New England by two species, one common, the other extremely rare but occurring more plentifully in the South and West. Mr. Scudder has recently published a revision of this genus (*Psyche* (1892), p. 265 et seq.).

21. *Hippiscus tuberculatus* Pal. d.
Beauv. Figs. 21, 21a.

Acrydium tuberculatum. Palisot de Beauvois, Insectes d'Afr. et d'Amer. 145, pl. 4, fig. 1. (pt. 9.) (1817). (Teste Saussure, 87.)

Locusta corallina. Harris, 176.

Oedipoda phoenicoptera. Scudder, 468; Smith, — Me., 151, — Conn., 371; Thomas, 135.

Hippiscus tuberculatus. Saussure, 87; — Addit., 27 (var.); Fernald, 42; Scudder, Psyche, (1892), 303; Morse, 105; Beutenmüller, 297.

Antenna: ♂, 10.5-12; ♀, 11.5-13.5. H. fem.; ♂, 14-16; ♀, 18.5-20.5. Teg.: ♂, 24-30; ♀, 30-32. Body: ♂, 25-28; ♀, 36-44. Total length: ♂, 32-38; ♀, 39-43.

Yellow-winged examples of this species have been taken but are very rare. Oftentimes the head, pronotum and hind femora, even in the half grown nymph, are largely greenish.

This is the largest and most striking locust of the present group. Owing to its gaily colored wings it is a conspicuous object in flight, but it is sufficiently alert and active to make its capture a matter of some difficulty, being both very ready to take wing and flying a considerable distance. The ♀ is much less active than the ♂ and is difficult to flush more than once or find unless marked down with great care. Both are occasionally secured in sweeping. The stridulation of the ♂ is a rapid rattle, louder, but similar to that of *Arphia sulphurea*, with which species

this is commonly found associated. It is found in bushy pastures and untilled land of light soil or elevated location.

The young, which may be found as early as the latter part of August, are curious little depressed, toadlike objects usually purplish leaden in color. They may be found, under suitable conditions, in the fall, winter, and early spring months in localities frequented by the adult.

This species appears in the winged state about the first of May, probably sometimes in the last week of April, and may be found until the middle or latter part of July. I have taken it on May 8 and July 13.

I have seen it from Norway, Me.; and have examples from Keene, N. H. (Prof. Weed); Brattleboro, Vt. (Mrs. J. B. Powers); Winchendon, Marlboro, Sudbury, Wellesley and several towns in the immediate vicinity, in Mass.; Thompson, and So. Kent (young), Ct. It is also very widely distributed outside of New England.

22. *Hippiscus rugosus* Scudd.

Fig. 22.

Oedipoda rugosa. Scudder, 469 (1862). Smith, Me., 151; Thomas, 132.

Hippiscus rugosus. Saussure, 85; Fernald, 42; Scudder, Psyche, (1892—, 287; Morse, 105; Beutenmüller, 298.

This species does not differ materially in size from its congener, the preceding, which is the only one with which it is likely to be confused, and from which it is readily distinguished by the form

of the head and pronotum. The wings are usually yellow, often pale yellowish-white, sometimes orange or even red.

This is our rarest Oedipodine, and the only one which I have not met in the field in an extended experience in collecting the New England locusts. Reported from Norway, Me., by Smith, and eastern Mass. by Scudder, nothing

is recorded concerning the date of capture or character of the locality where found. It probably occurs, however, in localities similar to those frequented by its congener. Numerous specimens which I refer to this species were found by Mr. S. W. Denton in Ohio and Illinois in midsummer.

THE LARVA OF LYCOMORPHA PHOLUS.

BY HARRISON G. DYAR, NEW YORK.

1839. Harris, Silliman's Journ. Sci. Arts. XXXVI, 318.

1862. Harris, Ins. Inj. veg. 341.

1869. Melsheimer, Harris' ent. corresp. p. 112.

1882. Packard, Papilio III, 181.

1896. Dyar, Proc. Boston soc. nat. hist., XXVII, 136.

Harris states that the larva lives on lichens growing on rocks.

Melsheimer found them on lichens on the trunks of hickory trees.

The full grown larvae occurred to me not uncommonly on an old stone fence at Jefferson Highlands, N. H. in the middle of June. Eggs were obtained a month later.

Egg. Laid singly, adherent. Oblately spheroidal, the lower half more flattened than the upper, both well rounded; a little elongated in one diameter, but only just perceptible. No true reticulations, but the surface is distinctly flattened in hexagonal areas, the edges of which are not defined into elevations, but form simple angles of the surface. These areas are rather large in proportion to the egg, regular. Surface a little granular. Color shining dark bluish green. Diameter .5 mm.

Stage I. Head bilobed, black; width .3 mm. Body all whitish, the hairs long and pale; tubercles concolorous. The hairs are barbed and arise singly from the small

tubercles, normal, subprimaries absent. On the thorax seta ii b is distinctly present, not weak; i a, i b and ii a in line, rather remote. The head is blackish with sutures inky black. Length of larva 1.5 mm.

Mature larva. Gray, dotted with pale green with thin, very long, blackish hairs. Head bilobed, clypeus large, lower part pale; brown with two pale green, narrow, transverse, irregular lines; hairs short, white; width 1.5 mm. Body rather flattened, brown gray with many irregularly triangular, transversely streaked patches; a geminate, rather large, anterior segmental, dorsal, pale yellow one on joints 5 to 11 is most distinct, the others whitish, smaller and confused. Legs pale, two setae on the obscurely corneous plate. I have described the other setae.

The spottings seem to represent broken ad-dorsal, lateral, suprastigmatal and sub-stigmatal lines. The coloration closely resembles the lichen covered rocks, so that the larvae are only seen on close examination.

Cocoon. A fine arched thin web on one side of a stone.

Pupa. Delicate, thin shelled, pale brown. Smooth, not tapering much till the anal segments, compact, motionless, though two incisures stretch out somewhat when the moth emerges. Anal end smooth, no trace of cremaster. Cases compact, the leg and an-

tennae cases firmly united in one piece at emergence; basal parts of first legs entirely concealed, the maxillae reaching down the center to the tip of case. Abdominal segments punctured.

THE BUTTERFLIES OF HILDESHEIM.

OUR countryman, Mr. A. R. Grote, has signalized his appointment to the charge of the Roemer Museum in Hildesheim by establishing an issue of papers under the title *Mittheilungen*. These appear by numbers in imperial octavo, very handsomely printed and illustrated. No. 8 is concerned with the butterflies of Hildesheim and is by Mr. Grote himself, as four previous numbers have been (44 pp., 4 pl.) Its subject would not much interest American naturalists did the paper not go far beyond what the title indicates, being mostly concerned with a general classification of butterflies (or at least those of Hildesheim), which in several points differs materially from classifications in vogue, if any can be called in vogue in this time of flux.

Butterflies are first divided into two great groups, the Parnassi-Papilionidae and the

Pieri-Hesperiiidae. The first contains the two groups indicated by its title, regarded as families. The second includes ten families, which in their order downward are Pieridae, Nymphalidae, Agapetidae (Satyridae), Limnadiidae (Danaiidae), Libytheidae, Nemeobiidae (*Nemeobius lucina*), Riadiniidae (Erycinidae—non European), Lycaenidae, Hesperiiidae and Megathymidae (Megathymus—an American type). The last five families Grote looks upon as an early and simultaneous offshoot from the Pieri-Hesperiidian stem, which last culminated in the Pieridae, but on its way thereafter threw off the branch which included the remaining families, in the order Libytheidae, Limnadiidae and Agapetidae.

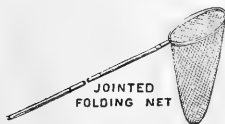
The scheme is based solely on the wing-venuration and has its merits and demerits on this ground. The most striking innovation is the primary subdivision which ignores previous dichotomy by leaving the Hesperiiidae in conjunction with others; a minor one is the separation, with family signification, of *Nemeobius* from the Riadiniidae; it shows the length to which one may go in discussing classification from a single standpoint.

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NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—VI.

BY ALBERT P. MORSE, WELLESLEY, MASS.

16. DISSOSTEIRA Scudd.

Dissosteira Scudder 1876. U. S. Geog. Surv. W. of 100th merid., Wheeler, ann. Rep't, 1876, appendix JJ, p. 291.

Saussure, while acknowledging the priority of Spharagemon, refers to *Dissosteira* the species here treated under the names of *Dissosteira*, Spharagemon, and Scirtetica. As genera are now recognized both *Dissosteira* and Spharagemon should receive generic rank, Scirtetica perhaps being excepted.

23. *Dissosteira carolina* Linn.

Locusta Carolina. Harris, 176.

Oedipoda carolina. Scudder, 468; Smith, — Me., 150, — Conn., 371; Thomas, 117.

Dissosteria carolina. Comstock, 104.

Dissosteira carolina. Saussure, 137; Fernald, 43; Morse, 105; Beutenmüller, 298.

Antenna: ♂, 9.5-11; ♀, 11.5-13. Hind fem.: ♂, 12.6-14.7; ♀, 15.5-20.5. Teg.: ♂, 28-33.5; ♀, 36-43. Body: ♂, 24-28; ♀, 33-42. Total length: ♂, 34.5-42; ♀, 43.5-53. mm.

Though quite variable in appearance this species is readily recognized by its

black wings with pale border. The border varies from dull white to yellowish buff. The most striking variation, however, is in the ground color of the body, which varies in examples from the same locality from light yellow to dark fuscous or even bright reddish brown. The tegmina are sometimes markedly trifasciate, sometimes evenly maculate or almost unspotted.

This is a very common and widely distributed species, and probably the best known of the group, owing to its conspicuous black wings and habit of frequenting roadsides. From the prevailing brown tints of its coloring it has in some localities received the name of "Quaker." In correlation with its large wing expanse its flight is powerful and erratic, and in hot August afternoons it may often be seen hovering motionless in the air or dancing up and down above a particular spot and stridulating, an act which is doubtless to be looked upon as a sort of courtship. It is an alert species, well able to take care of itself, and on warm days rather difficult to secure.

It appears early in July,—I have taken it on the 7th—and is common until late in the fall. It is found over the whole of New England with the

probable exception, as noted by Mr. Scudder, of the highest mountainous portions. I have examples from various parts of all of the New England States and from Martha's Vineyard, Penikese, and Cuttyhunk Ids.

17. SPHARAGEMON Scudd.

Spharagemon Scudder 1875. Proc. Boston soc. nat. hist., xvii, 467.

The treatment of the New England species of this genus in my two recent papers* is so full that a mere outline need be given here.

24. *Spharagemon collare scudderii* Morse. Figs. 24, 24a.

Oedipoda collaris. Scudder, Final Report Geol. Surv. Neb., 250 (1871).

Spharagemon aequale subsp. *scudderii* Morse, Proc. Boston soc. nat. hist., xxvi, 225 (1894).

Spharagemon collare subsp. *scudderii*. Morse, Psyche, vii, 297.

(See remarks under *S. aequale* in Psyche, vii, 293.)

Antenna: ♂, 11.5-12.5; ♀, 11-11.5; Hind fem.: ♂, 13-14; ♀, 14-16.5. Teg.: ♂, 23-24.5; ♀, 25.5-28.5. Body: ♂, 21-23; ♀, 27-29. Total length: ♂, 28.5-30.5; ♀, 32-35.5 mm.

A common but rather local species found from early in July till October; it occurs in open fields on dry uplands, preferring sandy soil. It is recorded from southern Maine, Vt., and various

points in Conn. and eastern Mass., including Martha's Vineyard and Nantucket Ids.

25. *Spharagemon saxatile* Morse. Figs. 25, 25a.

Spharagemon saxatile. Morse, Proc. Boston soc. nat. hist., xxvi, 229 (1894). Morse, 105;—also Psyche, vii, 294; Beutenmüller, 300.

Antenna: ♂, 12-14.5; ♀, 12-14. H. fem.: ♂, 11.5-14; ♀, 14-17. Teg.: ♂, 21.5-25.5; ♀, 25-31. Body: ♂, 20-24; ♀, 28-34. Total length: ♂, 27-32.5; ♀, 32-39 mm.

A handsome species, common from the latter part of July till October on the bare ledges of rocky hills in Mass. and Conn., and only occasionally found on sandy ground. In appearance and habits it resembles *Circotettix verruculatus*, with which it is sometimes found associated.

26. *Spharagemon bolli* Scudd. Figs. 26-26c.

Spharagemon bolli. Scudder, Proc. Boston soc. nat. hist., xvii, 469 (1875). Morse, 105, — Psyche, vii, 290; — Proc. Boston soc. nat. hist., xxvi, 227.

Spharagemon bollii. Beutenmüller, 300. Fernald, 43; Saussure, 140.

Spharagemon aequale. Comstock, 104.

Antenna: ♂, 10-13; ♀, 11-13. H. fem.: ♂, 12.5-13.5; ♀, 12.5-17. Teg.: ♂, 20.5-25; ♀, 23-28. Body: ♂, 20.5-22; ♀, 27.5-33. Total length: ♂, 26-30.5; ♀, 29-38 mm.

*Proc. Boston soc. nat. hist., xxvi, 220-240 (1894);—Psyche, vii, 287-299 (1895).

A common and widely distributed species found throughout New England from early July to late October in bushy pastures and barren grounds on dry upland soil.

18. SCIRTETICA SAUSS.

Scirtetica Saussure 1884. Prodro-mus Oedipodiorum, 135 (subg. nov.).

27. *Scirtetica marmorata* Harr.

Figs. 27-27 b.

Locusta marmorata. Harris, Report, p. 145, (1841); Treatise, 3rd ed., 179.

Oedipoda marmorata. Scudder, 472; Smith, Conn., 372; Thomas, 111.

Dissosteira marmorata. Saussure, 141; Fernald, 44.

Scirtettica marmorata. Morse, 105; Beutenmüller, 303.

Antenna: ♂, 10.5-12.5; ♀, 9.5-10.5. H. fem.: ♂, 9.3-10.7; ♀, 10.5-12.5. Teg.: ♂, 17-20; ♀, 20.5-22.5. Body: ♂, 15-19; ♀, 22-25. Total length: ♂, 21.5-25; ♀, 25-29 mm.

While usually recognizable by the markings of the tegmina this species is extremely variable in color and widely

so in markings even in the same locality, some examples being chiefly ashy, more or less maculate with black; others chiefly blackish fuscous, marked with white, yellowish, or reddish-brown; others again entirely bright rufous, sometimes of the tint of red hematite. It is one of the handsomest of our locusts, but next to *Hippiscus rugosus* is probably the least known of our Oedipodinae, since, though widely distributed, it is extremely local.

Like the species of the preceding genus it is a wide-awake and rather shy locust, best secured by marking down and cautiously approaching, capturing it with a swift sweep of the net as soon as within striking distance. Its stridulation and flight are very similar, perhaps indistinguishable, from those of *Spharagemon bolli*.

I have met with it in but three localities; in each of these it is common and is found on sandy barrens but scantily clothed with vegetation. My specimens were secured between the dates of Aug. 2 and Sept. 5 at Provincetown, Mass., West Chop, M. V., and North Haven, Ct.

NEW AND LITTLE-KNOWN COCCIDAE FROM FLORIDA.

1. DETERMINATIONS AND DESCRIPTIONS, INCLUDING A NEW GENUS.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

The Coccidae herein recorded were sent to me by Mr. A. L. Quaintance, who gives below the particulars as to their occurrence.

(1) PSEUDOPHILIPPIA, n. g. — A Lecaniine Coccid with, in the adult ♀, rudimentary legs and antennæ; secreting a profusion of cottony matter, which completely covers and hides it. Skin not chitinous. Apparently

allied to *Filippia* (or *Philippia*) of Targioni Tozzetti, a European genus, which, however, has well-formed legs and antennae.

Pseudophilippia quaintancii, n. sp. — ♀ Light yellow, bright yellow when boiled in caustic soda, drying brownish; oval or broad pyriform, about 2 mm. long, secreting a mass of snow-white cottony material, about 4 by $3\frac{1}{2}$ mm., which completely covers and hides it.

Skin not chitinous; very thickly crowded on the dorsal surface with round glands. Antennae rudimentary, stout, little more than twice as long as broad, segments indistinct, sometimes there seem to be but two, of which the first is the longer; sometimes four, the first very short, the second longer, the third shorter than the second, the fourth about as long as the second, and beset with numerous bristles. The legs are small conical stout claw-like protuberances. Anal plates pale yellowish-brown, short and broad, with rounded ends; there is a finger-shaped chitinous process on each side of the anal ring, pointing caudad. Anal ring with few bristles these stout.

A half-grown individual shows a few short simple marginal spines. In this the legs and antennae are rudimentary, practically as in the adult.

At bases of leaves of pine (*Pinus*), April 10, 1897. (Quaintance No. 2.)

(2.) *Lecanium parvicornis*, n. sp. — ♀ scale about 5 mm. long, 4 broad and 3 high, of the ordinary Lecanium form, rather shiny; with irregular longitudinal series of conspicuous pits, one row on each side subdorsally, and two irregular and subconfluent rows laterally. Color of scale ochreous often with a pinkish tinge, with irregular black spots accompanying the rows of pits. Sometimes there are suffused blackish longitudinal bands in place of the spots. Under surface of ♀ dull pink.

The ♀, boiled in caustic soda, turns the

liquid crimson. The eggs inside her turn bright crimson, strongly contrasting with her yellowish-brown skin. Mouth-parts very small for the size of the insect. Antennae short and broad, rudimentary, about $2\frac{1}{2}$ times as long as broad, tipped with bristles, joints obscure. Legs equally rudimentary. Skin not tessellate, but with scattered gland-spots. The skin is very little chitinised, except in the anal region. ♂ scales ordinary, granular, more or less overlapping.

Newly hatched larva oval, pale pinkish, with two very faint suffused longitudinal dorsal bands of darker color.

On twigs of pine (*Pinus*), April 10, 1897. (Quaintance No. 3.) A very distinct species, with austral affinities.

(3.) *Lecanium tessellatum* Sign., var. *perforatum* (Newst.). On leaves of *Eugenia* in greenhouse, (Quaintance, No. 5.) I will take this opportunity to refer again to the Jamaican species found on *lignum-vitæ*, which has been considered to be *tessellatum*. It is larger, and differs in some other particulars, for which see Tr. Am. Ent. Soc. XX. (1893) p. 51. Since this Jamaican insect appears to be at least a distinct variety, I will call it var. *Swainsonae*, after the lady — an excellent entomologist — who first collected it.

(4.) *Asterolecanium pustulans* (Ckll.). On fig, April 5, 1897. (Quaintance, No. 1.)

(5.) *Aspidiotus perseae*, Comst. On Magnolia, April 1, 1897. (Quaintance, No. 4.) The ♀ after laying eggs becomes reniform. On boiling the females, the contained embryos appear colorless, with large globules of the brightest orange imaginable. The ♀ becomes light yellow, the mouth-parts brownish; and the pygidium, and especially the lateral margins of the hindmost half of the body, remain deep reddish-brown, being chitinous. The dark chitinous margin is noticeable in the unboiled females. Newly hatched larva light orange.

II. BIOLOGICAL OBSERVATIONS.

BY A. L. QUAINANCE, FLA. AGR. EXP. STA.

(1) *Pseudophilippia quaintancii*.— I first observed this insect April 10, 1897, at Lake City, Florida. The top-most branches of a large pine (*Pinus australis*) that had recently been cut down was found to be badly infested. The insects were crowded thickly around the more tender growth, and from their abundant excretion of cottony substance were quite conspicuous for some distance away. Abundant honey-dew is excreted, which in some cases had formed a medium for the growth of "black fungi" (*Meliola spp.*). In several of these instances the entire cottony mass of a colony of these insects was quite black. Since this species was first noticed, it has been observed on quite young pines of the same species as above. It seems to be quite generally distributed in this locality.

(2) *Lecanium parvicorne*.— This insect has been collected from *Pinus taeda* and *Pinus australis* here at Lake City. A group of young pine trees (*P. taeda*) were observed to be somewhat dwarfed and sickly. A close inspection revealed the presence of this scale in considerable numbers— possibly the cause of the stunted appearance of the trees. The adult scales inhabit the more terminal branches, probably last years growth. The young scales were crawling around in

great abundance when first observed, April 10. At this date, April 22, they have become fixed, mainly to the tender shoots which have grown during the present year. These are frequently quite covered by them.

The scale has been found less abundantly on *Pinus australis* than on *P. taeda*. Professors Roelfs and Webber have observed this scale at Tallahassee, Florida.

(3) *Lecanium tessellatum* Sign., var. *perforatum* (Newst).— Collected from leaves of *Eugenia jambos* in the greenhouse of the Agric. Exp. Station. Plants infested were recently purchased from a nurseryman in the southern portion of the State.

(4) *Asterolecanium pustulans*.— Sent in by a correspondent from Brevard Co. Fla., who reported it as very injurious to his fig trees. That this scale is very severe on the fig tree there can be but little doubt. Infested twigs were abnormally thickened, and covered thickly with shallow pits inhabited by the older scales. Scales of varying ages were to be observed on the same twig, from crawling young, to adults.

(5) *Aspidiotus perseae*.— Abundant on the lower surface of leaves of *Magnolia glauca*. More sparingly found on leaves of *Ilex opaca*.

DIPTERA FROM THE HEADWATERS OF THE GILA RIVER.—II.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEX.

TABANIDÆ.

Four ♀ specimens of *Tabanus* (probably subgen. *Theriopectes* OS.), from the West Fork, show two distinct forms easily separated by differences in the antennae, front, and markings of the abdomen. They look much alike, are of the same size and have the same general coloration. I have examined descriptions of all the North American species, but am unable to identify these two forms with any of them. They agree with each other in the following characters, in most of which they approach *T. rheinwardtii* Wd. OS.

Wings clear hyaline, without spots or bands, costal cells clear except a yellow line at stigma. First posterior cell open full width. No stump at bend of anterior branch of third vein, which bend is not angulate but rounded. Eyes faintly but distinctly pubescent. A slight ocellar tubercle, not or hardly denuded. Palpi stout, and rather broad basally. Third antennal joint with a well developed process at base. Thin tuft of black hair between base of wings and humerus.

They differ particularly from *T. rheinwardtii* (syn. *erythrotelus* Walker. See Westwood's figure, Dipt. Saund. pl. 2, fig. 1) as follows: Basal portion of third antennal joint much shorter, and more widened, angle more prominent. Abdomen grayish-slate to blackish, not reddish on sides or with hardly a tinge of red, no median row of triangles. No clouds on wings,

first posterior cell not at all coarctate. They may be separated from each other by the following descriptions.

7. *Tabanus gilanus* n. sp. Two ♀ s. West Fork Gila, July 10 to 16. Taken from horses.

Length, 14 mm. Eyes (not revived) show two dull green, oblique stripes on a cupreous-brown background, running from inner front angle of eye to outer upper border. Front just perceptibly narrowed anteriorly, parallel portion but little more than $2\frac{1}{2}$ times as long as vertical width. Callosity sub-round, notched above, in one specimen connected with the subcallus, in the other not. Subcallus widened, longitudinally elongate, in one case prolonged by a line above, in the other deeply notched. A brownish tinge on each side of subcallus and on vertex. Callosities shining black. Front otherwise cinereous pollinose, the portion next antennae pale reddish and less pollinose. First antennal joint widened apically, apical width equal to length, but less than width of basal portion of third joint. Second joint very short, ending in a spur on upper edge. Basal portion of third joint as wide as its whole length, angle of process blunt; annulate portion as long as basal, stout but last joint elongate and tapered. First two joints reddish-yellow, third same color at base with rest black. Palpi pale yellowish, white-hairy with but few black hairs. Face, pectus, and pleura white-hairy. Thorax and scutellum whitish pollinose, with four heavy blackish vittae on thorax rather closely approximated, a slight reddish-yellow tinge apparent on sides of thorax. Abdomen slate-color or blackish, with a median longitudinal whitish line widened on hind margins of segments.

On each side a line of oblique whitish elongate linear markings reaching hind margin of segments. Dark parts of abdomen with black hairs, light parts with whitish hairs. Legs mostly brown, middle and hind tibiae and proximal half of front tibiae brownish-yellow. Middle and hind femora white-hairy, also light parts of tibiae.

8. *Tabanus intensivus* n. sp. Two ♀s. West Fork Gila, July 13 to 16. Taken from horses.

Length, 14 mm. Eyes (not revived) unicolorous cupreous-brown, without apparent stripes. Front almost imperceptibly narrowed anteriorly, parallel portion about $3\frac{1}{2}$ times as long as vertical width. Callosity subround, more or less irregular, notched above, with connecting line to subcallus, which is nearly as wide as callus proper, in neither case denuded, with a distinct or nearly obsolete brown tinge on each side. A distinct or subobsolete brown tinge at vertex. Callosities reddish-brown, but little darker than the reddish-yellow or yellowish-red part of front next antennae. Front otherwise grayish-white pollinose. First antennal joint ending in a sharp point on upper edge at an acute angle, its apical width a little greater than width of basal portion of third joint; second joint short, ending in a spur on upper edge; basal part of third joint not quite so wide as long, the process ending in a hook-like angle (*i. e.*, there is a very short minute spur projecting anteriorly from angle of process). Annulate portion considerably shorter than basal, rather stout. Antennæ wholly deep black, with only base of first joint slightly reddish in one specimen, and all but upper anterior point of first reddish-yellow in the other. Palpi white-hairy, in one yellowish-white with no apparent black hairs, in the other very pale yellowish with but few black hairs. Face, pectus and pleura white-hairy. Thorax and scutellum whitish pollinose, with four heavy blackish vittae on thorax; scutellum reddish

on apex or wholly so, with reddish-yellow on adjoining posterior part of thorax extending extensively on sides. Abdomen soft black or brownish-black, first segment with a whitish spot in middle; second with an oblique white marking on sides widened posteriorly and reaching hind margin, and with a narrow white hind border on median portion. Third segment with a subsemicircular or triangular median white spot on hind margin, and an oblique lateral marking smaller than that of second segment. Fourth with a large median white triangle reaching front margin, and small lateral spots faint or subobsolete. Fifth with a small white median triangle, lateral spots faint or subobsolete. Sixth and seventh segments show the median and lateral white only when the insect is held on a level with the eye. Legs as in *gilanus*.

9. *Tabanus punctifer* O. S. One ♂, and one ♀. Head of East Fork Gila, DD Bar ranch, July 22.

SYRPHIDÆ.

10. *Eristalis latifrons* var. *maculipennis* n. var. One ♀. Head of East Fork, July 22. (See Psyche, 1897, p. 40.) Also numerous specimens from the Mesilla Valley of the Rio Grande, etc.

I propose this name to distinguish the variety, whose characters I pointed out in Trans. Am. Ent. Soc. xxii, p. 49. It is principally distinguished by the brownish cloud on the wings.

CONOPIDÆ.

11. *Zodion fulvifrons* Say (typical form). One ♀. West Fork Gila, July 18. Length, 6 mm. This specimen belongs to the typical form, or that described by Say himself as *fulvi-*

frons. It is characterized by having the front reddish-yellow with vertex brown, the legs brown, abdomen with no yellowish or reddish except at tip, three thoracic lines, and the black median pair of abdominal stripes pronounced.

The present specimen has the median thoracic line more pronounced than in the variety *abdominale*, but still narrower than the outer ones. The pollen of fourth, fifth, and sixth segments assumes a strong golden hue, especially when viewed obliquely from in front. Fifth and sixth segments and base of seventh reddish-yellow under the pollen. The median abdominal stripes are deep black; they form two widened subsquare markings on second segment,

two broad lines on third, and two narrow lines on fourth. They are widened at hind margin on second and third segments. Very few dots present in the pollen of abdomen. These in the main are the characters of the typical form.

All the other specimens that I have taken in New Mexico (Mesilla Valley, Organ Mts., Tularosa Plains) are var. *abdominale* (3800-5500 ft.). The present is the only one of the typical form taken, and it comes from about 7000 ft. elevation. (See paper on Dipt. Organ Mts. for notes on var. *abdominale*.)

N. B.—By mistake the species given in section I of this paper were not numbered. They include numbers 1 to 6. Those in this section are numbered from 7 on.

TWO FORMS OF FLUTED SCALE.

UP to the present the famous Fluted Scale (*Icerya purchasi* Maskell) of California has been regarded as a single species, without any important variations. I was therefore surprised to learn from Mr. Alex. Craw that over six years ago he had noticed that there were two distinct forms, and that his subsequent experience had shown him that they remained distinct, and did not depend on location or food-plant. Mr. Craw has been so good as to send me living adult females of the two varieties, and they can be readily distinguished as follows:—

(1.) var. *maskelli*. Female (after forming ovisac) slate grey or very dark purplish-grey, sometimes brownish in the middle, with marginal dull orange spots. Back little covered by secretion. More hairy at the cephalic end than the next. Ovisac not so large as in the next; tinged with yellow just behind the body of the insect. Mr. Craw says this is the form they had in Los Angeles. It is *purchasi* in the strict sense, and agrees

very nearly, though not entirely, with Maskell's description.

(2.) var. *crawii*. Female (after forming ovisac) light pinkish or yellowish-red, the margin orange, with bunches of short black bristles. The back is largely covered with yellowish-white secretion. Ovisac somewhat larger and longer. Legs somewhat smaller, femora decidedly more slender. This may prove to be a distinct species, but the larval and adult characters, except those mentioned, agree so well with *purchasi* that it seems best to give it only varietal rank.

Both forms were sent on *Citrus*; the precise locality not stated. Mr. Craw says: "When I sent two large boxes of infested branches from Lodi to San Gabriel to stock the two large glass breeding houses for *Vedalia cardinalis* that the State Board erected there, I saw that the light colored scale [*i. e.* var. *crawii*] retained its characters there on the orange trees."

T. D. A. Cockerell,
Mesilla, N. M., May 30, 1897.

THE SPECIES OF ANABRUS AND THEIR DISTRIBUTION.

FROM an examination of over two hundred specimens of Anabrus from different parts of the west, there appear to be four species in the United States. The first described was (1) *A. simplex* Hald. (Stansb. Expl. Utah, 372, pl. 10, fig. 4) which was first recorded from Salt Lake and is found over the interior plateau west of the Rocky Mts., and north of southern Utah to the Sierras and, beyond them, in northern California, Oregon and Washington. The figures of the species given by Glover (Illustr., pl. 9, fig. 1, pl. 14, fig. 5), Thomas (Hayden's Fifth Ann. Rep., pl. 1, fig. 1), and Packard (Second Rep. Ent. Comm., 164) belong here, and this is probably the case also with the figures of Herman (Verh. zool.-bot. ges. Wien, 24: pl. 6, figs. 76-86), which I formerly doubted (Rep. Chief. eng., 1876, 500).

The second species described was (2) *A. purpurascens* Uhl. (Proc. Ent. soc. Phil., 2: 550), a name which must be restricted to the species found east of the Rocky Mts., from Montana, Dakota and Manitoba over the prairies and plains as far as Kansas. The

type specimens (in my collection) come from Red River, Manitoba, and the specimens mentioned by Uhler from Texas and Washington probably belonged to other species. *A. similis* Scudd. (Hayd. Rep. Nebr., 249) is a synonym of this. The figures given by Glover (Illustr., pl. 17, figs. 10, 11) belong here, but that by Packard (Second Rep. Ent. Comm., 163) belongs to the next species.

This is (3) *A. coloradus* Thom. (Hayden's Fifth Ann. Rep., 440), redescribed in part by me (Rep. Chief Eng., 1876, 500), a mountain and alpine form, found mostly in Colorado but also extending south to New Mexico and Texas, unless the specimens from the latter state (of which I have but few, in poor condition) belong to *A. purpurascens*. As stated above, this species is figured by Packard under the name *A. purpurascens*.

A (4) fourth undescribed species in my collection, from Texas, is readily distinguished from the others by its much slenderer and relatively longer legs. The other species referred at different times to Anabrus do not belong here (See Can. Ent., 26: 180-81).

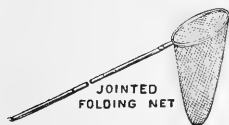
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SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

EXCHANGE.

I wish to obtain any literature on insects, especially Coleoptera, not already in my possession. In exchange for such works in any language I offer good material from the west and the far north, mostly Coleoptera.

H. F. WICKHAM,
Iowa City, Iowa.

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PSYCHE.

BIOLOGICAL AND OTHER NOTES ON AMERICAN ACRIDIIDAE.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Tettix granulatus Kirby. This species flies in arches from six to ten feet in length and a foot in height at the most, without swerving to one side or the other.

Chloealtis conspersa Harr. The eggs have a slight curve, so that when the embryo is formed it lies with the head downward and the back slightly bent. The surface of the egg is microscopically reticulate, the cells of the reticulation 0.035 mm. in diameter with raised walls between them. During the winter the embryo is in a stage of development apparently equivalent to the second or third stage of *Diplax* as given by Packard; the labium is unmistakably grouped with the legs and nearly as long as they; it is not until spring that the abdominal segments are mapped out, at least upon the dorsal and ventral surfaces. The eggs are excluded cap foremost, and in different pods counted were 10, 11, 14, 10, 4, 6, 6.

In the Geology of New Hampshire I gave some account of my observations on this insect at Sudbury, Vt. Subsequently I elsewhere observed that the number of notes of the male in stridulation varied from seven to sixteen and that in the sun the rate at which they

were produced was nearly four per second.

At West Campton, N. H., June 3, I found in one egg-cluster the empty puparium of a Tachinid fly, and in another cluster, on removing the cap, the pupa of *Trichodes nuttalli* which yielded the beetle June 23d. Dr. LeConte determined the beetle and wrote at the time that "*T. alvearius* of Europe lives in the larval form in nests of mud wasps and *T. apiarius* of Europe in bee hives"; in still another cluster I found a coleopterous larva, never determined, between the eggs and the cap; it was fat and plump, although the eggs were untouched.

Stenobothrus curtipennis (Harr.). I have timed the stridulation of this species many times with somewhat varying results. I noted first, what I have already published, that "the notes are produced at the rate of about six a second and are continued from one and a half to two and a half seconds," but that they were less rapid when the sky was overcast. These were from observations at Hampton, N. H. At Jefferson, N. H., on a warm and sunny afternoon, I observed that the rate was

nine per second and the duration as before, but the observation was not a very extended one. Later, at the same place I took more careful observation, and have noted it as certainly correct, that the duration was as before and the rate ninety-four in fifteen seconds. As in *Chloealtis conspersa* the first one or two strokes are frequently noiseless, the femora apparently failing to strike the tegmina; and when they are struck the notes are shorter than the succeeding. At Sudbury, Vt., this species occurred almost exclusively in the uplands, rarely in the low meadows.

The ovaries are very large and thick, pale pinkish at base, pale or colorless apically; the eggs appear to be arranged upon them like the bristles of a brush, having their free tips turned toward the middle line of the body; the larger eggs are beneath and the upper portions of the ovaries are attached together quite strongly by a delicate tissue. The eggs of opposite sides touch by their tips, are pale yellowish and appear to be in three, possibly four, tiers. Of several females dissected August 15, I counted in one 39 eggs on one side, 30 on the other; in another 45 and 42 respectively; in a third, 38 on each side. Still another had no eggs at all, but instead the entire abdominal cavity was crowded with the coils of a Filarian worm, which when removed measured nearly two feet in length.

Encoptolophus sordidus (Burm.). The imago first appeared at Sudbury, Vt., on Aug. 15, in 1868, the specimens still pale from freshness. In Cam-

bridge, Mass., Oct. 10, 1867, the males were very abundant, but not a single female was noticed.

The eggs are extruded cap-end foremost, and laid in a mass in drilled holes in bare spots in sandy compact loam, so deep that the top of the pod is about two centimeters below the level of the ground. Late in the afternoon of September 30, at Andover, Mass., I noticed a female which had just completed her task standing within her own length of her filled-up hole, the whereabouts of which was revealed by the scratched appearance of the soil, completely exhausted; her ovipositor was hoary with froth and she made no attempt to escape. She had evidently further eggs to lay. A second open hole only a few centimeters away had no eggs, but near the bottom an elaterid larva was discovered which probably led to the abandonment of the hole.

Camnula pellucida Scudd. July 22, 1867, this species appeared in very great numbers at Jefferson, N. H., the males more abundant than the females. It was the first pleasant day after four days of storm, just before which the fields where these occurred showed no mature specimens at all.

Dissosteira carolina (Linn.). The eggs are laid in a mass as in *Melanoplus*, only the pod is larger. In one found in Springfield, Mass., laid in damp soil, there were about forty eggs, which were laid not horizontally but with a slight obliquity, and the diameter of the pod was about half as long again as one of the eggs. In a pod formed

on the side of a knoll, where the earth had afterwards fallen away, partially exposing the eggs, each exposed egg had been pierced by a parasite, *Scelis ovivorus* Riley, which emerged Sept. 18, one from each egg and about a dozen in all.

A male and a female taken in coitu at Niagara Falls, Aug. 18, were preserved and from the body of the female there issued early in September two Tachinae which Mr. C. H. Tyler Townsend has identified for me as *Sarcophaga oedipodinis* Towns. Ms.

An embryo 7 mm. long and nearly formed was observed some years ago. As viewed from above the prothorax is no larger than the other thoracic segments and these are entirely similar to the abdominal, no regional distinction being perceptible. The hind femora are long and reach the end of the third abdominal segment; the tibiae are bent at right angles toward and across each other, the tarsi curving backward, outward, and upward. The middle legs are not alike. On one side, the femur lies upon the base of the hind femur and the tibia and tarsi bend sharply back upon the femur and parallel to it; on the other, the femur lies entirely within the hind femur (*i. e.*, toward the middle line of ventral surface of body) and the tibia bends at first at slightly less than a right angle to it, then is twisted, and the tarsi are finally directed toward a point between the insertion of the middle and hind legs of the opposite side, and the extremity apparently between its opposite neighbors. The fore

femora run in the same direction as and parallel to the hind femora and the tibiae and tarsi are bent sharply back upon the femora but run a little beneath both them and the tibiae of the opposite pair, so as to be only partially visible.

The labrum, strongly bilobed at apex is bent downward and appressed against the face, the two mandibles (the black denticles at tip being formed) being separated from each other by the labrum, their insertions being nearly or quite as far apart as those of the forelegs. The maxillae seem to arise in the middle line beside and partially concealed by the mandibles, directed outward, and one of them twice as long as the other; the two halves of the labrum arise in a similar way, but lie beneath the mandibles. The antennae come down in front of the eyes, being pushed toward them by the protuberant mandibles; one of them is broken, nothing but the stump being visible! Just behind the base of the hind femora, in the place of the body of doubtful character in Rathke's figure of the embryo of *Gryllo-talpa*, is a shining lenticular elevation.

In 1865 the imago first appeared on June 29. On Oct. 10, 1867, the species were by no means uncommon in Cambridge, but I could find only females, and the late Mr. Sanborn told me that the same was true on the same day at Andover, Mass.

Mr. J. A. Allen tells me that in Iowa the species occurs only by roadsides and in rather dry places. A specimen flew into the window of the late Professor

Baird's house in Washington, D. C., on the night of July 19, 1868.

Dictyophorus reticulatus Thunb. A specimen kept in captivity was excessively deliberate in its movements; to clean its antennae it treads upon one at a time and draws it from under its feet; it was very tame and would leap but a few inches at a time. Two specimens from Lookout Mt., Tenn., were sent me by Mr. B. P. Mann, both females, and when received (by mail) one had eaten the entire abdomen of the other excepting the sternal portions and the ovipositor; yet the injured specimen did not seem to mind it greatly!

Melanoplus femur-rubrum (De Geer). At Sudbury, Vt., specimens taken in low meadows differed from those captured in hollows of dry upland hilly pastures in being darker colored and having more contrasted coloration. Three quarters of an hour after sunset on a cloudy evening in August a specimen was unable to see my hand, as

it several times did not move until touched; then, however, it jumped to another blade of grass. The experiment was tried several times with the same individual and with the same result.

Melanoplus collinus Scudd. This species was found abundantly at Sudbury, Vt., where, on Aug. 15, no eggs could be found in the ovaries of the females examined; the ovaries were spread as a mere film on the intestines and no eggs could be detected with a strong pocket lens.

Melanoplus femoratus (Burm.). The ovaries in this species occupy the dorsum of the body from the metathorax to the fifth abdominal segment inclusive; at the latter point the oviducts turn ventrad, clasping the alimentary canal, meeting beneath and turning backward together to the ovipositor; the tracheae pass between the ovaries and the intestine and branch upon the former.

A RARE TRACT.

THERE has lately been presented to the library of the American Entomological Society by Mr. Wm. J. Fox, a small pamphlet ($3\frac{1}{2} \times 5\frac{1}{4}$) from the library of the late T. R. Peale, which bears the title: "Catalogue of the Lepidoptera of New Orleans and its vicinity, prepared by L. von Reizenstein. Printed for R. C. Kerr, librarian of the New Orleans Academy of Sciences, New Orleans 1863." There are some items of interest in the catalogue to which attention may be called. The following species are credited to the district mentioned.

"*Papilio protesilaus* Dru. Greenville, rare." This is given by Kirby as a synonym of *Sinon* Fabr.

"*Goniopteryx eclipsis*" = *Gonepteryx macrula* Fabr.

"*Xanthidia (Terias) sylvatica* Mss. rare, Western Lake Shore."

"*Heliconia diaphona*" = *Ithomia diaphanus* Dru. Dr. Scudder says of this species (Syn. List; Buff. Bull. 2, 246, 1875): "I cannot find any authority for the occurrence of this butterfly within our limits, [excepting Edwards, Synopsis, and Mr. Edwards does not recollect upon what grounds he placed it there.]"

"*Argynnis briarea* Godt rare." "*Leminitis ? cadmus* Cram. ? *pherecides* Cram." These last two are synonyms of *Aganisthos acheronta* Fabr.

"*Apatura myops* Mss. on elm trees."

"*Calisto zangis* Fabr."

"*Thecla io* Mss. City Park, rare. On *Cammomilla*."

"*Thecla ixion*" Fabr.

Lists of moths are also given under "VESPERIDAE, PHALAEINIDAE and TINEADAE." A list of nondescripts is given which includes thirteen butterflies and sixty-one moths. There have been very few collectors in the locality and I am quite prepared to believe the above mentioned species were found. Species new to our fauna are constantly being recorded from Florida and Texas which have been described from further south. Mrs. Slosson has recently caught a number of species in Southern Florida hitherto only known from the Antilles. *Henry Skinner.*

NOTES ON EPHYRA PENDULINARIA.

The following notes were made nearly forty years ago for a study of the insects of sweet-fern (*Comptonia*) which I may possibly still be able to complete.

The caterpillar was first observed Aug. 22, 1859, at South Windsor, Conn., and the following description taken:

Color, green; head rust-red with yellowish streaks, and a few scattering hairs; frontal triangle whitish; head appendages except tip of mandibles which are black, white; eyes partly black and partly rust-red. Terminal segment and prolegs roseate spotted with faint green, with a green stripe down hind-most prolegs; body with ten or twelve rows of dots, or continually interrupted lines of a fainter green above, about as many beneath, taking up half the space; stigmatal line very slightly and irregularly pinched. Three rows of short, very fine black hairs on each segment transversely, the center row having but half as many as either of the others, which have but ten hairs in a row, equally above and below; the central row seems to be irregular, and wanting on some segments; legs whitish with a few hairs on them. Length $+\frac{3}{4}$ in; breadth $-\frac{1}{10}$ in.

The thoracic segments and basal joints of legs so contractile that the caterpillar can

put all three pairs together on the jaws, with scarcely a bend in the body, and when he does so these segments are so swollen as to give a clubbed look to the caterpillar. When moving, it swings its body sideways (standing on its prolegs) like a pendulum for a while, and then with great tremulousness and frequently touching the surface, goes on. In eating, it cuts deep holes in the leaf, eating at the edge, eating backwards very voraciously for about one-eighth of an inch; then beginning again where it started it goes over the bitten space eating deeper and deeper till the whole is sometimes deeper than wide; it is fond of placing its prolegs on the end of a branch and looking out upon the outer world. It will spin a thread; it often will stand upon the midrib with its prolegs and curving its body, place its legs a little way above the surface, and here remain a long while, looking like a kangaroo ready to leap.

It went to the under side of an oak leaf in its tumbler on Aug. 26, and began spinning, attaching itself by a fine silk circle to the terminal prolegs, and fastened a thread around one of its segments after the manner of butterflies; changed the same day to a chrysalis, throwing the larval skin entirely away.

Chrysalis light green, a black stripe broken twice toward the end on each side, along the hinder margin of the wing. Two protuberances, one at the base of each wing, white, brownish at base; tail-piece almost colorless, tip red. Abdominal segments of a lighter color than the rest, with dots of a lighter tint; anterior half of each abdominal segment punctate, posterior half minutely striate; a thread crosses the body upon which it rests suspended; the thread splits into two at the ends, being fastened at four points: the back is slightly roofed on thoracic segments; the tail-piece is immersed in a silken mass, by which the body is retained in position; head end of the body flat and as if truncate; two projections like warts at base of each wing; the head is square, and the breast flattened; the sides of the body half way down

the wings quite straight, then it has a little inward curve to the end of the wing, tapering to the tip which is pointed; the outline of the back has an inward curve to a point about two-thirds way down the wing; the tip of wings is on the fourth abdominal segment which they almost cover.

Dec. 9. The chrysalis has turned itself around, and a change has occurred within a few days, for now, instead of green, which it was a week ago, the whole chrysalis is of a satin color and has a little of the satin lustre; the color is uniform throughout; the posterior border of the fourth to sixth abdominal segments are dull golden; the spiracles are reddish. An *Ichneumon* fly emerged about the middle or end of December.

Specimens were next found at Princeton, Mass., July 15, 1861, and the following description of the caterpillar taken: Light green with longitudinal white lines, and dotted with white spots. A dorsal and three subdorsal lines; the dorsal straight, but the others broken and irregular, the stigmatal edge wrinkled, the white spots irregularly scattered. Body beneath with the white lines interrupted; the last segment with the anal prolegs and tip of the first pair of prolegs slightly reddish; thoracic legs pale greenish, black at the tips; a few scattered hairs on the body. Head faint reddish, marbled with whitish, with two white stripes. Length four-tenths of an inch; greatest breadth one-twelfth of an inch.

On the night of the 15th it had taken to the top of the box in which it was enclosed, and had slung itself in a thread which crossed the body between the sixth and seventh segments, [2-3 abdominal segments] and had closed its anal prolegs tightly in a mass of silk spun at this point; it now remained motionless, the front part of the body hunched with head bent toward the legs which are gathered closely together. It changed entirely to a chrysalis on July 17, The disk of the wing, toward the tip, became very pale on July 25th; the legs began to darken, as well as the eyes by July 27; wings

all darkened on morning of the 28th, and emerged during the day.

Another caterpillar found at Princeton July 15, and probably an earlier stage of this species was light greenish with a reddish tinge above, with very faintly indicated lighter and darker bands; beneath and upon the lower portions of the sides, the green is of a yellowish tint; the reddish tint of the back is deepest on the thoracic and last three segments; there are a very few scattered, very short hairs over the body. The head is of a little deeper red, mottled with lighter, its posterior edge is black on the sides; the triangular spot is lighter, and the edge of the labrum and some parts of the mouth darker. The legs are dirty with darker tips; the prolegs are like the segments which have them. Length $\frac{3}{10}$ of an inch.

Later, again at Princeton, Aug. 24, 1861 I found another specimen in general aspect very much resembling the older specimen from Princeton already described, the coloration only being different. It was exceedingly dark green, almost black upon the dorsal and lateral surfaces; streaked on dorsal surface with yellowish just as in the normal type; streaked heavily on lateral surfaces with golden yellow, after the same style as in the other; beneath, the outer portions are brownish, and the inner dirty greenish yellow, all streaked with white longitudinally. Prolegs pale greenish, legs pale yellowish green, dotted with black. Head much as in the first, rust red streaked and dotted with yellowish white; antennae and labrum as there; black dots of body apparently the same as there, though the general color makes it difficult to distinguish them. Size as before. It changed to a chrysalis on Sept. 12.

On Aug. 12, I found at Princeton a caterpillar just about to turn to chrysalis; it was fastened to the midrib of a leaf of *Comptonia* near the middle, with the threads of the wing well separated and well pushed under.

Samuel H. Scudder.

EGG-LAYING OF DEIDAMIA
INSCRIPTA.A REPLY TO THE CRITIC OF
PSYCHE.

ON June 4, 1897, I found on the under side of a leaf of *Ampelopsis quinquefolia*, seven eggs irregularly set, but evidently laid at the same date, and that a recent one. The eggs were very dark green and, under a glass, showed slight "facetting," and were unmistakably sphingid. Further search brought to light a second leaf with six eggs, and a tendril with two.

Four days later these eggs all hatched, giving larvae marked with a reddish spot behind and below the caudal horn. The larvae were yellow with almost no tinge of green, and remained so after feeding for three days. My previous experience with young sphingid larvae has been that they grew green after one day's feeding. The caudal horn was black with the tip white and ending in two setae.

On June 17 I found, on the same vine, four similar eggs, but laid among the flower-buds in such wise as to be well concealed by their strong resemblance to the buds in both size and color. As the buds grew lighter in color before opening, the eggs grew lighter by the yellower tint of the developing larvae, so that they still were like the buds! It is one of the most perfect bits of protective imitation I have seen, and fully explains why I had before found no eggs, but only young larvae, of *D. inscripta*—as these proved.

After the first eggs found among the buds I hunted every bud-cluster within easy reach and found twenty more!

The first brood of larvae moulted but three times, and fed but twenty days, the second being the moult omitted. In spite of this the larvae grew to full size. The second brood has moulted three times at the usual intervals, and will probably moult again in three days.

Caroline G. Soule.

Brookline, July 1, 1897.

THE critic of *Psyche* is kind enough to notice "the Butterflies of Hildesheim" and concludes his remarks with the following paragraph:

"The scheme is based solely on the wing-neruation and has its merits and demerits on this ground. The most striking innovation is the primary subdivision which ignores previous dichotomy by leaving the Hesperidae in conjunction with others; a minor one is the separation with family signification of *Nemeobius* from the Riodinidae; it shows the length to which one may go in discussing classification from a single standpoint."

Perhaps the shortest and most complete reply to the above is, that had I discussed the classification of *Nemeobius* from a single standpoint and that standpoint the neuriation, I should have referred the genus to the Pieridae. That I did not do so, that everywhere I have pointed out the characters of convergence in the neuriation, that my study of the latter is an attempt to show, however imperfectly and for the first time, the *direction* which the evolution of the veining assumes with the butterflies and that this direction is held and the characters repeated in distinct groups—all this seems to have been overlooked by the critic. With regard to *Nemeobius* I show that, while the Riodinidae are hardly separable from the Lycaenidae (*Zephyrini*) on pterogostic grounds, the neuriation of *Nemeobius lucina* contradicts the same characters in both the Riodinidae and Lycaenidae. To unite it with either of these groups is to do violence to characters which have been long in forming, whereas to divide the Riodinidae from the Lycaenidae is to lay stress, perhaps undue stress, upon characters which have manifestly taken a shorter period to bring out. By a parity of reasoning I must conclude that the "family" importance of *Nemeobius* must be granted.

As to the most striking innovation, the primary subdivision, I show that the Parnassi-Papilionidae are bound together by the most striking characters found anywhere throughout the neuration of Prof. Comstock's division Frenatae. The swallowtails are more specialized than all the other butterflies through the absorption of vein viii of the secondaries and, in this respect, resemble the highest Saturniadae, such as the genera *Rothschildia* and *Samia*. The radial system of the Papilionidae, aside from the state of the median system, cannot be said to be more generalized than in the Nymphalidae. The radial system of the Parnassiidae is more specialized than in any of the "four-footed" butterflies, in which no absorption of the radial veins has taken place. No other group within the order has the short, downwardly curved spur-vein on internal margin which I have called vein ix, and which I grant may be considered a generalized character of the Parnassi-Papilionidae. The neuration of the Parnassiidae, taking the same developmental direction as elsewhere, accentuates characters commenced to be shown by the genuine swallowtails and the family must reasonably be considered to have emerged from the Papilionidae, than which it is the more specialized group. Since all the other butterflies possess vein viii as a loop to vii at base, or a scar of same, while in the Agapetidae it has become lost, and the Papilionides have instead a strong spur-vein oppositely curved, it is clear they stand apart and are not to be ignominiously placed next above the skippers, as they are, for instance in the Philadelphia Check List. After all butterflies have wings and these wings constitute a record.

So far I believe I reply adequately to the critic of *Psyche*, who, I think, can hardly have followed the text of my *Fauna* closely. I may finish with a word upon the methods of illustration employed to show the neuration. At the time I had so much daily work in making and in studying when made

the very many necessary preparations of the butterflies, that I had no leisure to study the wings of the moths. I relied, in fact, generally upon the accuracy of all hitherto published drawings of venation. But, after the first part of the *Fauna* had gone to press, it occurred to me to compare my photographic illustrations with the engravings of others authors. To my surprise I found that Dr. Spuler's figure of the primary of *Pieris brassicae*, given in his inaugural dissertation which has been much quoted in America, differed widely from my own. An examination showed me that an entire vein, running out to the external margin, had been added by Dr. Spuler. But this was a matter which after all did not concern me nor my *Fauna*. What did concern me was, that Mr. Meyrick had figured five primary wings of Geometridae in the Transactions of the Entomological Society of London part i, 1892, and that I had relied upon the accuracy of these figures for my statement that in the Geometridae vein viii was present as a fold and vein ix as a vein, "tubular" or otherwise. Mr. Meyrick figures the primary of *Pseudopanthera macularia* and four others. After my experience with Spuler, and also because I must soon in turn occupy myself with the Geometridae, I made preparations of the wings of *P. macularia* and four other, different but sometimes allied forms to those given by Mr. Meyrick. I was greatly disconcerted at finding that Mr. Meyrick's figures were as faulty as Dr. Spuler's. Vein viii was a regular "tubular" vein in all five, and, therefore, Mr. Meyrick should not have represented it by a dotted line which indicates a fold or scar, in other words a degenerate vein. But the worst of all was, that there was not a trace of vein ix to be seen; the curved line, as representing here a vein, introduced so artistically by Mr. Meyrick in each and all of his illustrations was absolutely wanting in nature. With this my suggestion that the Geometridae might be on the line of descent of the Parnassi-Papil-

ionidae falls away and I am still on the search for possible ancestors for my Papilionides. And this leads me to believe that photographic methods are probably the only reliable ones for reproducing neuration, and that my efforts for the introduction of photography in the illustration of lepidoptera, commenced first more than twenty years ago, as recently kindly remembered by Mr. Moffat in the pages of the Canadian Entomologist, were efforts bringing fruit. Let me flatter myself also that my efforts to vitalize the study of the wings of the butterflies will not have been in vain, nay, more, that they may even be ultimately crowned by the restoration of Papilio.

A. Radcliffe Grote, A. M.
Roemer Museum, June, 1897.

HAYWARD ON BEMBIDIUM.

IN THE Transactions of the American entomological society, vol. 24, p. 32-143 (Feb.-May, 1897), Mr. Roland Hayward publishes a valuable monograph on the species of Bembidium of America, north of Mexico. One hundred and twenty-four species are recognized as valid, twenty-four are described as new, and two new names are pro-

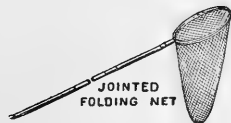
posed for preoccupied names. The original descriptions of thirteen species described by Chaudoir, Mannenheim, and Motschulsky, as yet unidentified, are reprinted in an appendix. In 1857, Dr. Leconte found Duval's grouping of the European species of Bembidium not at all applicable to the species of our fauna, and published (Proc. acad. nat. sci. Phila., p. 2-6) a catalogue of the species found in the United States and contiguous northern regions, together with a tabular separation of the species into groups. Leconte's keen perception of the true affinities of species, evident in all his work, is well shown here, as Mr. Hayward, after a thorough study of a large amount of material, proposes but a slight modification of Leconte's order of arrangement of the groups, suppresses one of his groups, and erects but a single new one. Mr. Hayward's analytical tables are well prepared, and, though useful, should be relied upon only in connection with the descriptions; each species is fully described. The synonymy is carefully worked out, in most cases by direct comparison with the types; an adequate bibliography is given, and the habitat of each species is noted in more detail than usual in works relating to our fauna.

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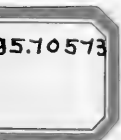
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PSYCHE.

NOTES ON NEW ENGLAND ACRIDIDAE.—III. OEDIPODINAE.—VII.

BY ALBERT P. MORSE, WELLESLEY, MASS.

19. PSINIDIA Stål.

Psinidia Stål 1873. *Revensio Orthopterorum*, i, 117, 133.

28. *Psinidia fenestralis* Serv. Fig. 28.

Oedipoda fenestralis. Serville,—*Hist. nat. d. Ins., Orth.*, 726, (1839), Thomas, 118.

Locusta eucerata. Harris, 180.

Oedipoda eucerata. Scudder, 472; Smith,—*Conn.*, 373; Thomas 119.

Psinidia fenestralis. Saussure, 161; Morse, 105; Beutenmüller, 303.

Psinidia fenestralis. Fernald, 44.

Antenna: ♂, 10.7–12.3; ♀, 10–12.
H. fem.: ♂, 9–11.7; ♀, 11–13.5.
Teg.: ♂, 15.5–20; ♀, 17.5–24.
Body: ♂, 15–17.5; ♀, 19–25. Total length: ♂, 20–24; ♀, 23–30 mm.

Though presenting some resemblance to the species of *Spharagemon* and *Scirtetica* and frequently found in the same locality this locust is readily distinguished from them by the strongly constricted pronotum, the form of the antennae, and the venation of the tegmina, as noted in the Key.

The antennae are unlike those of any other species of the subfamily in the depressed, prismatic form of the joints, appearing almost ensiform next the base.

Another peculiarity noticeable is that on the distal third of the tegmina the maculation is restricted to the costal half.

In general coloration this species varies widely, according to environment, from pale dust-color to bright reddish brown or even black. The most interesting feature connected with its coloration, however, is the variation in the color of the wings. As noted before, these may vary in specimens from the same spot from dull white through yellow and orange to vermilion red. This is no doubt due in part to age, but seems also to depend upon other conditions, partly, it is probable, upon humidity as suggested by Prof. Bruner, but principally, I believe, upon temperature.

Nearly one-half of my specimens taken on the sea-beach at Stamford, in the warmest corner of Connecticut, are red-winged. At West Chop, M. V., and Provincetown, Mass., in the same situation, all are yellow-winged. At Wellesley, Sherborn, and Dedham, Mass., several miles inland, red-winged examples are comparatively scarce. At No. Conway, N. H., all are yellow-winged. Mr. Henshaw informs me that many of his specimens from Nantucket

are red-winged. While much collecting needs to be done before one can feel certain, I believe that it will be found that the red-winged form is most common in the warmest parts of New England.

This is a common and widely distributed species, occurring nearly everywhere on sandy spots in southern New England, and probably throughout the entire district. On the seashore it is sometimes associated with *T. maritima*. It is usually plentiful where it occurs, though often very local in consequence of its habitat. When disturbed it flies for but a short distance, often only a few feet, the male producing a very slight, scarcely noticeable, crepitation.

I have taken it on various dates from July 17 to Oct. 7 at Fryeburg, Me.; No. Conway, N. H.; Provincetown, Revere, Sherborn, and Wellesley, Mass.; Watch Hill, R. I.; Canaan, Montville, Niantic, Stamford, and Thompson, Ct.; and offshore on Martha's Vineyard, Penikese, and Cuttyhunk Ids. Mr. Henshaw has found it common on Nantucket in late Sept., and it has been taken at Norway, Me., by Smith (M. C. Z.).

20. *TRIMEROTROPIS* Stål.

Trimerotropis Stål 1873. *Reconsilio* Orthopterorum, i, 118.

29. *Trimerotropis maritima* Harr.

Fig. 29.

Locusta maritima. Harris, Report, 143 (1841); Treatise, 3rd ed., 178.

Oedipoda maritima. Scudder, 472; Smith, Conn., 373; Thomas, 124.

Trimerotropis maritima. Stål, loc. cit., 134; Saussure, 172; Fernald, 45; Morse, 105; Beutenmüller, 299.

Measurements. Antenna: ♂, 11-13; ♀, 11.5-14. Hind fem.: ♂, 11.5-14.5; ♀, 14.5-16.8. Teg.: ♂, 23-27; ♀, 29-35. Body: ♂, 20-25; ♀, 28-35. Total length: ♂, 28.5-33; ♀, 36-43 mm.

An easily recognized species, not likely to be mistaken for any other occurring with us. The sides of the pronotum vary considerably in the degree of prominence of the angulation, sometimes being almost rounded, sometimes with a distinct, tooth-like projection. In color it varies with the soil of the locality, the ground-color ranging from white to light brown, more or less sprinkled with dusky blotches; these are sometimes nearly obsolete, and again nearly confluent on the head, pronotum, and base of tegmina. Specimens from North Haven, Ct., show numerous bright rufous fleckings, agreeing with the reddish color of the soil at that place. This variation in color is often marked even in a small area, as I noticed at Block Id. where a portion of the beach is much darker than the rest, and the locusts frequenting that part agreed with it in tint.

This is a common species along the sandy sea-beaches of southern New England, but while common it is one of the wariest and most difficult to capture of all our locusts. Extremely shy, it starts up before the pursuer is within

reaching distance and flies rapidly for many rods. Even when marked down it is very difficult to see, owing to its close resemblance in color to the sand on which it alights. I know of but one locality where it is found away from the sound of the surf,—this is at North Haven, Ct., where it occurs sparingly on barren sandy wastes.

I have taken adult specimens on July 24, and Mr. Henshaw found it plentiful on Nantucket Id., on Sept. 22.

It is found on the shore of all the seaboard New England States. I have seen specimens from West Beach, Me. (5 nymphs, M. C. Z.); Hampton, N. H. (Scudder); Salisbury Beach, Mass. (A. L. Babcock); and have taken it at Provincetown and West Chop, M. V., Mass.; Watch Hill and Block Id., R. I.; Niantic, North Haven, and Stamford, Ct.

21. *CIRCOTETTIX* Scudd.

Circotettix Scudder 1876. Bulletin Geol. & Geog. Surv. Terr., ii, (appendix) 264.

30. *Circotettix verruculatus* Kirby.

Fig. 30.

Locusta verruculata. Kirby, Fauna bor. Amer., Insects, p. 250, (1837).

Locusta latipennis. Harris, 179.

Ocdipoda verruculata. Scudder, 471; Smith, Me., 151, — Conn., 372; Thomas, 115.

Circotettix verruculatus. Saussure, 175; Fernald, 45; Morse, 105; Beutenmüller, 302.

About 120 New England specimens give measurements as follows: Antenna: ♂, 9–11.5; ♀, 10–11.5; Hind femora: ♂, 11–11.5; ♀, 13–14. Tegmina: ♂, 20.5–25 (usually 23–24); ♀, 24–28.5 (usually 27–28). Body: ♂, 21–23; ♀, 26–30. Total length: ♂, 26.5–32; ♀, 30.5–37 mm.

This is an easily recognized species, the only one likely to be confused with it being *Spharagemon saxatile* from which it may be distinguished by the narrow wing-band, enlarged radial veins, pale hind tibiae, and distinctly two-notched pronotal carina. In color it varies from a dark gray or brown to black sprinkled with ashy, darkest on the head and pronotum, palest on base of hind thighs, and with the tegmina indistinctly trifasciate. Occasionally specimens occur light yellowish-brown or ashy in color but as a rule the species is the darkest colored of all our locusts.

It is found plentifully in northern and western New England, its favorite haunts being bare ledges on elevated land and low mountains. On these it delights to bask in the sunshine, crawling about over the lichen-covered and weatherbeaten rocks with whose tints its coloring harmonizes, or to hover in the air above them, sharply stridulating. Its "song" in flight is the loudest produced by any of our locusts, and consists of a series of separate notes, clicks, or snaps, not a rattle, and is readily distinguished by this peculiar snapping quality. It is one of the wariest of our locusts, being especially shy and difficult

to approach during the warmer part of the day, when it often flies away to a distance of several rods and circles about, returning to the place whence it started, or dances up and down in the air, snapping loudly. The ♀ sometimes makes a soft flutter or shuffle of wings in flight, probably corresponding to the snapping of the ♂, and both sexes can fly silently at will. I have seen the ♂ stridulate when at rest, also, by rubbing the hind thighs against the tegmina, producing a "scratching" sound audible at a distance of three or four feet. The intercalary vein is toothed, in a low but continuous series, for its entire length in the ♂, and on the distal half or more in the ♀, in which the teeth are lower and barely perceptible.

It begins to appear in the winged state about July 15, on which date I have taken it in northern Vermont, and it may be found during the rest of the season. Henshaw has taken it at Bar Harbor, Me. I have specimens from the following localities: Deering, Portland, Norway, and Speckled Mt., Stoneham, Me.; Keene (Prof. Weed), No. Conway, Pinkham Notch, Mts. Pequawket and Washington, N. H.; Jay, Vt.; Greylock Mt., Adams, and Palmer, Mass.; and Canaan, Ct. Harris described it under the name of *latipennis*, and there are two specimens in M. C. Z. labeled Cambridge, indicating that it may be found in the vicinity of Boston, though I have yet to meet with it there personally.

NOTES ON THE GENUS DELTOCEPHALUS.

BY CARL F. BAKER, ALA. POLYTECHNIC INST., AUBURN, ALA.

The following notes are called forth by Prof. Osborn's late "Review of the Genus *Deltocephalus*" in Proc. Iowa Acad. Sci., more especially by the changes he has proposed in connection with the species described in the Prelim. List Hemip. Colo. The new species in the latter work were so described on my own authority and the true type specimens are in my collection. Hence I may be supposed to know why they were called "new."

Prof. Osborn's generalizations on the genus *Deltocephalus* seem to me at least very premature, especially in consideration of the fact that less than

a third of the American species occurring in collections were known to him at the time his paper was written. It seems questionable from a study of *all* the species if the genus can be naturally separated into groups along the lines he has indicated. Likewise, the excluding from the genus of *simplex*, *coquilletii*, *concentricus*, *bimaculatus* and *flavovirens* seems to me decidedly premature. His reconstruction of the genus, based upon a study of but a small proportion of our species, cannot but prove untenable. The genus, as it occurs in Europe, so far as our present knowledge goes, is a fairly homogeneous group.

Yet, Osborn's resurrection of the Burmeisterian genus which has not for years been used in this sense by European authorities, would break it up. We cannot cut out genera of wide extra-limital occurrence to fit American species.

Deltocephalus bilineatus G. & B. In Osborn's synopsis this species is placed with those having "pronotum short, more than twice broader than long," while in the type the width of the pronotum is somewhat less than twice the length.

Deltocephalus albidus O. & B. This species is not uncommon in various localities in Colo. from Fort Collins to Rabbit Ears Pass on the Continental Divide. I have it also from Onaga, Ks. (Crevecoeur). In the Colo. specimens the pronotal lines are often quite indistinct, while the elytral markings are often very dense, size and structural characters remaining constant. In the "Review" the face of this species is figured as having the genae with outer margin evenly curved from eye to clypeus, which would be a remarkable character. They are angulate below the eyes, as in all other known species of the genus.

Deltocephalus inflatus O. & B. This species is of frequent occurrence at Fort Collins, Colo., and in the adjoining foothills.

Deltocephalus reflexus O. & B. I have this species from New Bedford, Mass. (Hough); North Windham, Ct. (Morse); Onaga, Ks. (Crevecoeur); and it also occurs here at Auburn, Ala.

Deltocephalus concentricus Van D.

Osborn without explanation, refers *Thamnotettix flavomarginata* to this species and places them both in *Thamnotettix*. Both forms are common in the mountains of northern Colorado. I possess large series which show no intergradation between the two forms. *Flavomarginata* at least deserves a varietal name. The latter was described from a single female which lacked the inner transverse nervure on both sides. However in a large series this is exceptional.

It seems to me as great an error to depend upon characters drawn from the vertex alone, as upon those from the elytra alone. Errors in generic reference of Jassids are sure to occur as long as species are described from one or a few individuals taken in a single region. *Flavomarginata* answers the Burmeisterian characterization of the genus as closely as do some of the species referred unquestionably to *Deltocephalus* by Osborn. As characterized by Burmeister, the width of vertex between the eyes should scarcely equal the length. Yet, for instance, *signatifrons* placed as unquestioned *Deltocephalus* by Osborn, according to two of the latter's own figures, has the width of vertex between the eyes nearly a half greater than the length at middle.

A proper understanding of some of our dimorphic Jassids is nearly impossible to any except those who are doing work similar to Prof. Osborn's, yet this reference, which I do not say is incorrect, is made entirely without explanation or even indicated evidence.

Deltocephalus inimicus Say. I have specimens of this species from Illinois (Algonquin, Nason) entirely lacking the very characteristic black spots. I still believe, however, that these spots form one of the best characters for this species. It is a case similar to that of the genus as a whole; there are no grounds for the reduction of the species because certain individuals may vary in what has been regarded as the most important distinguishing character. The beginner, using Prof. Osborn's table, would make the spotless form a new species.

Deltocephalus weedi Van D. If the frontal sutures in this species were carried to a point at the tip of the vertex as figured by Osborn, it would be a character sufficient to separate this species as a very distinct genus.

Deltocephalus sexmaculatus G. & B. The reducing of this species to *signatifrons* is not only entirely unwarranted but impossible. The unique type* is before me, and also a large series of mature examples collected in the mountains of northern Colorado last summer. I cannot imagine how Prof. Osborn could reconcile even the figures of *sexmaculatus* in "Prelim. List Hemip. Colo." with those of *signatifrons* in the "Review." The species are totally distinct as shown by color, form and detail of structure. Moreover, *sexmaculatus* is a much smaller species, its ♀ being but 2 mm. in length, while Osborn gives *signatifrons* as 3.5

mm. He offers no explanation for this discrepancy.

Deltocephalus nigrifrons Forbes. *Fuscinervosus* is at least a distinct dark variety of this species occurring on the Pacific slope. Among other differences it has the female segment evenly, shallowly concave with the median tooth rounded. In *nigrifrons* this is much more deeply and angularly emarginate, the sides of the emargination arcuate and the tooth angular. *Vanduzeei* is entirely distinct, far nearer to *pulicarius* than it is to *nigrifrons*. It is much smaller, very dark, and has the female segment broadly, evenly, deeply, angularly emarginate, and entirely without a median tooth. I think for the present, at least, even *fuscinervosus* should be considered distinct.

I have very large series of all these forms and so far have found no difficulty in their separation. For the including also of *perpunctata* there are not yet sufficient grounds. *Perpunctata* is a very common species here in the South, and fairly constant in both generic and specific characters. As known at present, it differs from *nigrifrons* in size, form, and in important ♂ characters. Van Duzee described these in part. Osborn does not leave any of these names with even varietal value. In other words he assumes that it would be possible for all occurring in a single region to be bred from a single parent. I do not believe this can be done. Some of these forms are just as distinct and free from intergradations

* I do not know the origin of the Van Duzee "type" which Osborn speaks of examining. The original description was prepared from a single specimen, and that specimen has been in my collection ever since.

as for instance his *oculatus*, *debilis*, *minimus* and *sylvestris*, yet it is not even suggested that these may possibly be forms of one mutable species. A very close resemblance in general appearance between members of different genera is not uncommon in this and in other groups, as for instance among some of the Heliconiid butterflies.

Finally, Prof. Osborn's characterization of the conglomerate species *nigri-frons* as a whole, is totally inadequate, as it would readily include several very distinct undescribed species from the southwest U. S., Mexico and South America.

Deltoccephalus flavicosta Stål.

1862 Stål, Kongl. Vet. Akad. Handl.

Bd. 3. No. 6. p. 53 (flavicosta).

1892 Van Duzee, Can. Ent. XXIV.

p. 116 (flavocostatus).

This species is common throughout the moister tropical and subtropical regions of America, at low altitudes. Osborn now records it from Iowa. I have it from Maryland, D. C., Ohio, Kansas, and various points in the lowlands of Mexico and South America, the Herbert H. Smith collection containing specimens from Corumba, Chapada, Villeta Paraguay, and Piedra Blanca in Bolivia. The Nat'l Museum collection contains specimens from Va., and D. C., the latter taken on grape. The more southern forms are quite generally lighter.

This is Uhler's manuscript *retrorsus*. Van Duzee's redescription was fortunately under practically the same name. It seems rather peculiar that Osborn did

not reduce this species also to a synonym of *nigri-frons*.

Deltoccephalus bimaculatus G. & B. In the "Review," *flavovirens* is made a synonym of this species, though no reasons for so doing are given. I have before me large series of the males and females of both species, and they are as distinct as any two species in the genus. They are well separated as originally described.

Deltoccephalus debilis Uhl. I have seen nothing from this country approaching the European *falleni*, but we have *abdominalis* and *minki*, which are both good and distinct species, long known, described and figured in Europe, and represented in my own collection by very large series of both European and American specimens. *Debilis* is certainly quite variable but it runs into neither *abdominalis* nor *minki*. It would make a peculiar case indeed if two species, in Europe entirely distinct, should have in this country intergradations so numerous as to make them inseparable, and yet the aggregate of these intermediate forms be known under a later American name.

Even in forms of *debilis* with the elytra entirely black, I have never seen a specimen with the face black after the manner of *abdominalis*. The three species can be easily separated on the form of the female segment, variable though it may be in *debilis*. They also differ in the male claspers, an important character used long ago by Fieber, but not mentioned for any of the species in Osborn's paper. If Prof. Osborn

had studied this character in all the species and varieties of *Deltocephalus*, most of the errors in reference he has made would have been avoided.

Abdominalis is common in Colorado. *Minki* I have from New Bedford, Mass. (Hough). The record for *minki* by Provancher was undoubtedly correctly given and should not be referred to *debilis* in the bibliography.

Deltocephalus affinis G. & B.

1890 Van Duzee, Psyche, V. p. 390 (melsheimeri).

1891 Osborn, Ia. Ag. Exp. Sta. Bull. 13. p. 100 (debilis).

1892 Osborn, Rept. Ia. Ag. Soc. for 1892, p. 688 (debilis).

1892 Osborn, Papers on Iowa Insects. p. 56 (debilis).

1892 Osborn, Proc. Ia. Acad. Sci. I. pt. 2, p. 12 (debilis).

1892 Harrington, Ottawa Naturalist, VI. p. 32 (melsheimeri).

1893 Osborn, Bull. 30 Div. Ent. p. 45 (debilis).

1894 Van Duzee, Trans. Am. Ent. Soc. XXI. p. 292 (melsheimeri).

1895 Gillette & Baker, Prelim. List. Hem. Colo. p. 84 & 88 (affinis and melsheimeri).

1897 Osborn & Ball, Ia. Ag. Exp. Sta. Bull. 34. p. 627 (melsheimeri).

1897 Osborn & Ball, Proc. Ia. Acad. Sci. IV. p. 211 (melsheimeri).

This, one of the commonest species of the genus, has been tossed about from "pillar to post" for some time. In the "Prelim. List Hemip. Colo." specimens given the name *melsheimeri* by Van Duzee were so left. One form

recognized as certainly not the *melsheimeri* of Fitch was named *affinis*. This species as seen above, has been repeatedly erroneously referred to *melsheimeri* by both Van Duzee and Osborn. The original description might apply equally well to *affinis* and to the true *melsheimeri*, except as to length. Fitch describes *melsheimeri* as 2.5 mm., while *affinis* will average 3.5. The matter could only be definitely settled by an examination of the original Fitch type in the Nat'l Museum, and this, now before me, shows the true *melsheimeri* to be an entirely different thing.

Deltocephalus melsheimeri Fh.

1851 Fitch, Homop. N. Y. State Cab. p. 61; reprint in Lintner's 9th Rep. p. 401. (melsheimeri).

1897 Osborn & Ball, Ia. Ag. Exp. Sta. Bull. 34. p. 637 (minimus).

1897 Osborn & Ball, Proc. Ia. Acad. Sci. IV. p. 211 (minimus).

Not knowing the true *melsheimeri* Osborn has redescribed it as *minimus*. Still, a good description of the genuine *melsheimeri* was much needed.

It seems to be a quite generally distributed species in northern U. S. east of the Rockies.

Deltocephalus unicoloratus G. & B.

1895 Gillette & Baker, Prelim. List Hemip. Colo. p. 89 (unicoloratus).

1897 Osborn & Ball, Ia. Ag. Exp. Sta. Bull. 34. p. 636 (oculatus).

1897 Osborn & Ball, Proc. Ia. Acad. Sci. IV. p. 212 (oculatus).

I have the type of this species before me. It is not especially near to *monticola* as suggested by Osborn. There is

some excuse for Osborn's redescription as the original description of *unicoloratus* (not "unicolorous") is not exact as regards female segment. A bent condition of the abdomen gave a very improper view for this part. Relaxing and remounting show it to be identical with *oculatus*.

Deltocephalus argenteolus Uhl. I have typical specimens of this species from Dr. Uhler, and also abundant material collected by myself on the plains in northern Colorado. I have also the types of *curtipennis* and *terebrans* and further specimens of both collected in 1896. Such an error as the reference of these two species to *argenteolus* seems inexcusable. *Argenteolus* is

small, slender, the female segment nearly truncate, the head immaculate, and the general color when fresh a brilliant, resplendent green. *Curtipennis* and *terebrans* are much larger, the head more obtuse, and heavily maculate, the female segment deeply emarginate, and the general color dull brownish cinereous. *Terebrans* was referred to *Eutettix* on account of the rather unusually strong transverse depression before the tip of vertex. It is an *Athysanus* and may prove the fully winged form of *curtipennis*, but there is less than no proof for it now, and hence for the present they must be kept separate.

THE LARVA OF CROCOTA OPELLA GROTE.

Egg. Slightly more than hemispherical, not narrow at base, flat below; shining pearly, faintly yellowish; diameter .55 mm. Reticulations obscure, narrowly linear, like fine lines traced on the otherwise smooth and level surface, more or less elongate, irregularly hexagonal.

Stage I. Head bilobed; pale reddish brown; width .3 mm. Body whitish with very long black hairs, single, normal, i-v present. Hair spinulated, i-iv black and especially long. Tubercles large, the edges adapted in slope to each other, luteous gray.

Stage II. Head whitish, eye black, mouth brown; width .38 mm. Body whitish, the warts concolorous; i very small, one-haired; ii large, many haired. Feet all pale. Hairs

slender, black, many of fair length and a few much larger, distributed all along the body.

Last stage. Head black above, clypeus and sutures brown; width 1.8 mm. Body uniform dull gray, warts and plates black. Hair stiff, black, short and uniform except from wart ii on thorax and iii on abdomen where it is long, forming a curious ridge of hair the whole length in the middle of each side. No marks.

Cocoon a slight sticky web of white silk. The pupa recalls *Hyphantria* in appearance.

The eggs are laid at the end of July and the larvae hibernates about half grown. The egg patches are placed on the leaves of bushes and trees, but the larvae drop to the ground on hatching. They eat almost any tender leaves, as with other Arctians. Found at Greenwood Lake, N. J., and Bellport, Long Island, N. Y.
Harrison G. Dyar.

NOTE ON HARRISINA CORACINA.

DR. DYAR has described the larva of this insect in *Psyche*, Nov., 1895. On July 22, 1896, I found a batch of the eggs, about 19 by 7 mm., on the under side of a leaf of mission grape in Mesilla. The eggs are rather irregularly placed, not touching one another except in a few cases. Shape elongate, about half as long again as broad, parallel-sided, roundedly truncate at ends; resting on one side, not on end; moderately shiny, iridescent, very pale lemon yellow, the surface appearing more or less granular. At that time the imago of *H. coracina* was flying in numbers in Mesilla, together with a few *H. metallica*. Both are at least double-

brooded. On July 26 the larvae had hatched from the eggs; these young larvae were very pale yellow, without marks; long hairs, some dark, some light; head large, slightly greyish. In 1897, the first *H. coracina* was seen on the wing April 24. I have been doubtful whether *H. metallica* is more than a simorphic form of *coracina*. A few days ago, my little son Martin brought me a pair in cop., *coracina* ♀ with *metallica* ♂. I have eggs from the ♀ now. Larvae of *H. coracina* occur here on Virginia creeper as well as grape.

T. D. A. Cockerell.

Mesilla, N. Mex., July 20.

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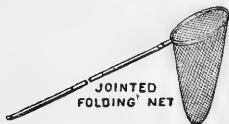
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PSYCHE.

THE CHRYSALIS OF FENISECA TARQUINIUS.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In Psyche for January, 1892 (Vol. vi) Dr. W. J. Holland gave a greatly enlarged figure of the chrysalis of *Spalgis s-signata* of West Africa to show the extraordinary likeness a slightly oblique aspect of the creature bore to a human or rather a simian face. This was the more curious because, as pointed out by him, a similar likeness had before been remarked in the chrysalis of our own *Feniseca tarquinius*, by Mr. Edwards and Miss Morton; and because in both cases the larva is aphidivorous — an exceedingly exceptional carnivorous habit for the caterpillars of butterflies. The original paper by Mr. Edwards, including Miss Morton's observations, will be found in the Canadian Entomologist for August, 1886 (vol. xviii). The simian resemblance has also been shown in an Indian *Spalgis* in the Journ. Bombay Nat. Hist. Soc., Vol. 3, pl. A.

In the early part of last August Lt. Wirt Robinson, U. S. A., sent me in alcohol from Hot Springs, Va., a chrysalis of *Feniseca* which he had found on the under side of a maple leaf and suggested that it would furnish an opportunity for a drawing which should show "the perfect resemblance which it bears to a face." I follow my friend's suggestion and show herewith

on the plate (3) opposite this page the result. The view, as will be seen, is dorsal and taken obliquely from in front and at one side, as this brings out best the characteristic features, and it is, moreover, nearly the same point of view as that used by Dr. Holland for *Spalgis*. The resemblance is not so striking nor so grotesque as there, nor is the expression so leering, but it can hardly be overlooked and is certainly extremely curious. A dorsal view of *Feniseca* also enlarged was given in the Entomological News for September, 1896 (vol. vii), but seems to be less satisfactory than a partially lateral view.

It may be added that Lt. Robinson found the larva feeding upon aphid colonies on the twigs of maple at Hot Springs, the species being doubtless *Pemphigus aceris* Monell. It has heretofore been found principally in the colonies of the alder plant-louse, *Schizoneura tessellata*, but also in those of *Pemphigus fraxinifolia* and *P. imbricator* of the ash and beach respectively. The larva has also been fed in captivity on aphides from other plants, and as it has been reported as occurring on still other plants may doubtless have a considerable range of aphid diet and probably be found anywhere on colonized plant lice.

THE NUMBER OF MOULTS IN INSECTS OF DIFFERENT ORDERS.*

BY A. S. PACKARD, PROVIDENCE, R. I.

It will be seen from the data here presented that the number of moults is as a rule greatest in metabolic insects with the longest lives, and that an excessive number of ecdyses is due to some physical cause, such as lack of food combined with low temperature.

In Campodea there is a single fragmentary moult (Grassi), while the Collembola (*Macrotoma plumbea*) shed their skin throughout life. (Sommer.)

In the winged insects, especially Lepidoptera, the number of moults is dependent on climate. Insects of wide distribution growing faster in warmer climates consequently shed their skins oftener; for example the same species may moult once oftener in the southern than in the northern States, as in the case of *Callosamia promethea*, which in West Virginia is double-brooded. Hibernating larvae moult once oftener than those of the summer brood (Edwards). Weniger by rearing the larvae of *Antheraea mylitta* and *Eacles imperialis*, and which when reared under normal conditions actually have the six stages, when reared in a warm moist atmosphere of about 25° C. have but five stages, *i. e.*, moult but four times. In the hot and moist climate of Ceylon,

A. mylitta has but five stages. (Psyche V, p. 28.)

Acrydians moult five times; *Dia-pheromera femorata* but twice (Riley); a katydid (*Microcentrum retinervis*) moults four times (Comstock). *Mantis religiosa*, according to Pagenstecher moults seven times, having eight stages, including that of the singular pre-nymph. Cockroaches (*Periplaneta americana*) are said by Marlatt to pass through a variable number of moults, there being sometimes as many as seven stages.

In the Homoptera there are in general from two to four moults; thus in Typhlocyba there are five stages, in Psocus four, and in Aphid at least three, and in Psylla four during the nymphal state. Riley states that the nymph of the female Coccid, *Icerya purchasi*, sheds its skin three times and the male twice. Notwithstanding its slow growth, Riley says, the 17-year Cicada moults oftener than once a year, and the number of larval stages probably amounts to twenty-five or thirty in all. The bed-bug sheds its skin five times; and with the last moult appear the minute wing-pads characteristic of the adult. In *Conorhinus sanguisuga* there are "at least two larval stages and pupal stages" (Marlatt).

In the May-fly, Chloëon, the num-

* Published in advance from the author's Text book of Entomology. Any corrections or additions would be thankfully received by the author.

ber of ecdyses is twenty. The Neuropterous *Ascalaphus* (Helecomitus) *insimulans* of Ceylon moults three times before pupating. Among the Mecoptera Felt has shown that *Panorpa rufescens* moults seven times.

In Coleoptera the normal or usual number is not definitely known; *Meloid* moults five times; *Phytonomus punctatus*, the clover leaf weevil, moults three times, according to Riley, who has observed that *Dermestes vulpinus* passes through seven larval stages.

In the breeding jars, with plenty of food and a constant temperature of from 68° to 78° F., the larvae cast their first skin in from four to nine days, the great majority moulting at seven days. Under the same conditions the second skin was cast at from four to seven days, the majority moulting at six days; the third skin at from three to six days, the majority moulting at five days; and the fourth skin at from three to six days, the majority moulting at five days; the fifth skin at from five to seven days, and the sixth skin at six days. There are thus seven larval stages. (Report for 1885, p. 260.)

Riley has ascertained that by rearing isolated larvae of *Tenebrio molitor*, one after being kept nearly a year had moulted eleven times, when it died. A second larva hatched June 5, had moulted twelve times by June 10th of the following year (1877), when it also died. Of *T. obscurus* three larvae were reared to the imago state. One moulted eleven times by August 30th of the same year, pupated Jan. 20th, 1877, and finally became a beetle Feb. 7, 1877. The other two both moulted twelve times and reached the imago state Feb. 18 and March 9th respectively. "All were, as nearly as possible, under like conditions of food and surroundings, and in all cases the moult that gave the pupa is not considered among the larval moults."

Two larvae of the museum pest (*Trogoderma tarsale*) were kept by Riley in a tight tin box with an old silkworm cocoon. "They were half grown when placed in the box. On November 8th, 1880, there were in the box twenty-eight larva skins, all very much of a size, the larva having apparently grown but little. The skins were removed and the box closed again as tightly as possible. Recently, or after a lapse of two years, the box was again opened and we found one of the larvae dead and shrivelled up; but the other was living and apparently not changed in appearance. There were fifteen larva skins in the box. We cannot tell when the one larva died, but it is certain that within a little more than three and a half years, two larvae shed not less than forty-three skins, and that one larva did not, during that time, appreciably increase in size. "We know of no observations which indicate the normal or average length of life, or number of moults in either *Tenebrio* or *Trogoderma*, but it is safe to assume from what is known, in these respects, of allied species, that in both the instances here referred to, but particularly in the case of *Trogoderma*, development was retarded by insufficient nutrition and that the frequent moulting and slow growth resulted therefrom and were correlated."* Further observations such as these are greatly needed.

Of the Siphonaptera the common cat and dog flea (*Pulex serraticeps*) moults three times before pupating (Howard).

In Lepidoptera the usual or average number of moults is four, but the number varies considerably, the greatest number yet known occurring in *Phyrrarctia isabella* which, Dr. Dyar informs me, moults ten times.

From Dyar's observations it appears that there are usually five larval stages,

* American Naturalist, xvii. May 1883, pages 547-548.

but six and seven stages are not infrequent, while there are eight in Scepis and Apatelodes and nine and ten in Arctians, while the European *Nolacentonalis* moults nine times, other species shedding their skins six times (Buckler). (Psyche, v, pages 420-422). *Callosamia promethea* moults but three times as a rule. *Orgyia antiqua* was found by Hellins to moult from three to five times. Riley found that in *O. leucostigma* the males moult four times, the female four but sometimes five times, while Dyar states that in *O. gulosa* the male larvae moult three or four times, the female always four times; while in *O. antiqua* there are six stages, and in the female seven. Lithocolletis, Chambers thinks, as a rule moults eight times, Comstock thinks *L. hamadryadella* casts its skin seven or eight times.

In the blow-fly (Calliphora) Leuckart and Weismann have inferred at least two moults, while Weismann suspects that there are as many as four. In *Musca domestica* we have observed that the larva moults three times; in Oestridae there are three larval stadia (Brauer). In Corethra there are four larval moults, and Miall thinks there are probably as many. In the phytophagous Hymenoptera there are three moults or four larval

stages in *Nematus erichsonii*, but Dyar informs me that less than four stages in saw-fly larvae is very rare, that he has only one record of less than five, and that that is doubtful; five for Nematid, six and seven for others, is certainly the rule. "The highest I have is the indication of eleven stages for *Harpiphorus variannus*" (Can. Ent., xxvii, p. 208). In Bombus we have observed five different sizes of larvae and hence suppose the least number of ecdyses is five, while we are disposed to believe that this insect as well as wasps and bees in general shed their skins as many as ten times during their entire existence.

The honey bee, Cheshire thinks, since he has found the red and ruptured pellicles, probably moults six times before it spins its cocoon, or passes into the semipupa condition. (Bees and Bee-Keeping, p. 20).

As to the cause of the great number of moults in the Arctians and the beetles experimented with by Riley, it would seem that cold and the lack of food during hibernation were the agents in Arctians, and starvation or the lack of food in the case of the beetles, such cause preventing growth, though the hypodermis-cells retained their activity.

DIPTERA OF THE ORGAN MOUNTAINS IN SOUTHERN NEW MEXICO.—I.

BY C. H. TYLER TOWNSEND, LAS CRUCES, NEW MEXICO.

In *Science*, for Dec. 8, 1893, the writer gave a general description of the

Organ Mountain range, which lies in the Doña Ana county, some fifteen miles

to the east of the Mesilla Valley of the Rio Grande. Data on the life-zones of these mountains are given in that article, and are revised somewhat in *Transactions Texas Acad. Science*, i, p. 79. A popularly written sketch of a trip to the Organ Mts. is given by Mr. Charles H. Ames in *Appalachia* for 1892. If the reader will take the trouble to look up and familiarize himself with this literature, he will have a fair idea of the more important topographical features of these mountains. While not extensive in area, they constitute a region of much interest from a biologic point of view. Their highest peaks reach to an elevation of 8,500 ft. above the level of the sea.

1. *Eupeodes volucris* OS. One ♀. Dripping Spring, Organ Mts. About 5600 ft. August 10. Length, 8½ mm. Legs reddish, bases of all the femora black, hind femora with but little more black than others, knees narrowly yellowish. Stigma of wings very pale yellowish, as is whole space between auxiliary and first longitudinal veins. Strange to say, there is some scattered pubescence barely visible on lower half of eyes. No pubescence is visible in many other specimens that I have examined.

Also one ♀. Soledad Cañon. About 5000 ft. August 15. On flowers of *Melampodium cinereum* DC. Length, 7.5 mm. Later in the season both ♂s and ♀s were taken in the Sacramento Mts.

It is a remarkable but well-known fact that the sixth segment in the ♂ of this

species is always unsymmetrical, and points to the right. So far as I know, the case is without parallel among the diptera. The asymmetry consists in the left lateral margin being oblique and nearly in a straight line with the left lateral margin of the fourth and fifth segments; while the right lateral margin is evenly rounded in outline. The segment is thereby thrown out of line with the longitudinal axis of the abdomen, and is left pointing to the right.

2. *Zodion splendens* Jaenn. One ♂. Soledad Cañon. About 5000 ft. August 15. On flowers of *Zinnia grandiflora* Nutt. This is a large specimen, measuring 11 mm., and is very pronounced in its markings and coloration. The face and front, except vertex, are unicolorous, both being of the same clear light yellow tinge. The fourth abdominal segment is wholly pollinose, except the pair of oval spots. Scutellum pollinose on whole upper surface.

3. *Zodion fulvifrons* Say var. *abdominale* Say. One ♀. Soledad Cañon. About 5500 ft. August 15. On flowers of *Pectis papposa* Gray (det. Ckll.). Length, nearly 7 mm. Front silvery dusted along orbits, yellow, reddish-yellow at vertex. Thoracic dorsum with a third, or median, more slender brownish stripe. Second abdominal segment nearly all yellow, hind border brownish, and a faint median line pale brownish. Anterior corners with a tuft of black hair. First, third, and fourth segments brownish; sixth and basal half of seventh reddish-yellowish; all

silvery pollinose. Pair of median stripes hardly apparent, and only on third segment. No black on legs or antennae. Otherwise agrees with Williston's description.

The common form of this species in New Mexico, especially in the Mesilla Valley, is the present one—that originally described by Say as *abdominale*. It is characterized in general by the front, median abdominal stripes, and legs being as described above. The thorax has the median brown line less conspicuous, or subobsolete; the abdomen with at least second and sixth segments mostly yellowish; abdomen sometimes wholly yellowish, in which case the median stripes may be moder-

ately distinct but reddish. See section II of paper on Gila Diptera (*Psyche*, 1897), for note on *fulvifrons*, typical form.

4. *Belvosia bifasciata* Fab. One ♀. Dripping Spring, Organ Mts. About 5600 ft. August 10. Not quite the normal type, but near it. Facial ridges ciliate half way up, but not as high as lowest frontal bristles. Third antennal joint about $2\frac{1}{2}$ times as long as second. Third and fourth abdominal segments wholly deep golden, as in the normal form. The claws in ♀ of this genus are always hooked and black on tips. The ♂ has the claws nearly straight, and without black.

LIFE HISTORY OF PYROMORPHA DIMIDIATA H. S.

BY HARRISON G. DYAR, WASHINGTON, D. C.

The larva of *Pyromorpha* has previously eluded detection on account of its peculiar habit. It lives beneath the fallen leaves in oak woods, feeding on the dead and decaying leaves. The larvae are solitary. The period from egg to cocoon is three months, June 15 to Sept. 15. The winter is passed in the cocoon as in the other species of the family. The coloration is dark brown and rather uniform to harmonize with the situation in which the larvae live.

Egg. Elliptical, a little flattened above and below like Geometrid eggs, but more elongate and cylindrical than those. White, moderately shining, soft and thin-skinned. Length 1 mm., height and width .6 mm. Reticulations distinct and regular, much rounded, like a series of contiguous circles.

Stage I. Head rounded, partly retracted, black; width .3 mm. Body thick, slightly

flattened, grayish white. Warts low, a group of hairs from tubercular bases, finely dotted spinulose, a small clear bulb at the base of each. Three warts and leg-plate seen, the larva wart with few hairs. Skin finely spinulose. The primitive first stage is absent.

Stage II. Head retracted in the fold of joint 2, black over the vertices of the lobes, clypeus pale, mouth pointed, brown; width .4 mm. Body sordid gray, in marks. Hairs numerous, from large low warts, stiff, shut, pale with black tips, spinulose with basal bulbs as before. Feet normal. Later a faint whitish subdorsal line is seen against the dark fold within, a narrow brown dorsal line and faint mottlings low down on the sides. Cervical shield brown.

Stage III. Head light brown with large black eye, retracted in joint 2; width .6 mm. Body thick and stout, densely hairy. Cervi-

cal shield large, exposed, dark brown and nearly naked. Color grayish like dead leaves, a narrow, dark brown dorsal line. Warts low, flat, but large in three rows. Hairs rather pale, but in general concolorous, stiff, sharp-pointed with clear basal bulbs. Under a high power the spinules are seen to form equidistant rings making the hair appear segmented. Skin densely minutely spinulose. The large pale warts give the appearance of broad, faintly paler subdorsal and lateral bands, separated by the straight dorsal and broken lateral brown lines which gradually become defined.

Stage IV. Head light brown, eye black; width .8 mm., retracted under the large, dark brown cervical shield. Body as before, the large flat warts pale, the ground color only showing as narrow chocolate brown dorsal and subdorsal lines, pale between the segments. Shaft of hairs segmented, the tips black, the bulb at the extreme base, small.

Stage V. Width of head 1.1 mm., as before. Warts brown in large pale gray areas which cut up the dark brown ground into straight dorsal, wavy subdorsal and broken stigmatal bands; subventral region pale brown; incisures dark, obscurely connecting the bands. Joint 2 pale in front, dark behind covering the head. Feet pale. On thorax warts i, ii, iii, iv+v and vi are present,

on abdomen i+ii, iii, iv+v, vi and leg-plate. Hairs segmented, sub-barbed with basal bulb which shrinks to an annulus at the end of the stage. The whole color becomes dark purplish at this time.

Stage VI. Head pale brown, lighter in the sutures; width 1.6 mm. It is retracted in the hood of joint 2, which is large with a large, dark brown, bisected cervical shield. Body thick and robust, not tapering, densely short hairy. Hairs segmented, with basal bulbs as before, well developed. Color dark velvety brown, reduced to a series of longitudinal and transverse lines by the large, rounded and slightly oblique pale gray areas which surround the upper three warts (i, ii+iii, iv+v on thorax, i+ii, iii, iv+v on abdomen). The warts themselves are brown, forming dark centers to the pale patches, not so dark as the ground color. Hairs on lower side of third wart (iv+v) longer, concealing the subventral region. Feet pale. Spiracles brown, the one on joint 5 moved up. A circular, pale, eversible area surrounds the spiracle on joints 6 and 11.

Cocoon. This is irregular, like *Harrisina* but larger, the main web brownish, a little wrinkly and opaque with some white floss silk outside. Size 13 x 6 mm. Spun between leaves on the ground.

DESCRIPTIONS OF TWO NEW FOSSORIAL WASPS.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

The two new fossorial wasps described below were discovered by Prof. George W. Peckham in Wisconsin, who will shortly describe their habits and life histories.

(1) *Astata leuthstromi*, n. sp. ♀.—Length 8 mm. Entirely black, shining, and sparsely clothed with a whitish pubescence. Head rather closely punctate, the clypeus truncate anteriorly and fringed medially with some black hairs, on either side of which are long glittering white hairs; palpi rufo-piceous; first joint of flagellum about $\frac{1}{4}$ longer than the

second, joints 2-4 subequal, about four times as long as thick. Mesonotum anteriorly finely punctate, posteriorly for at least half its length as well as the scutellum highly polished and with only a few minute scattered punctures; mesopleura punctate, closer and more distinctly so posteriorly; metathorax with a smooth impunctate space at base, confluent or regularly punctate posteriorly. Wings towards base hyaline. The apical half subfuliginous; the marginal cell is about as long as the first submarginal

cell; the transverse cubital veins are usually subangulately broken with more or less of a distinct stump of a vein issuing from the angle (the right wing has the third submarginal cell nearly divided into two cells by a spurious cross-vein from the angulation in the second transverse cubitus). Abdomen apparently smooth, impunctate, but with a strong lens the surface exhibits a fine or microscopical reticulation from very fine lines.

Hab.—Haitland, Wis.

Type, No. 3716, U. S. N. M.

This species is allied to *A. occidentalis* Cr. but is readily distinguished by its smaller size, the color of the wings, by the venation and by the smoothness of the mesonotum. Its resemblance to *A. unicolor* Say. is only superficial.

The species has been named in honor of Dr. Leuthstrom, father-in-law of Prof. Peckham, in whose garden the species was found.

(2) *Plenoculus peckhami* n. sp. ♂. Length 3 to 3.5 mm. Black, closely punctate and clothed with a sparse whitish pubescence, the face from middle of eyes and the clypeus with a dense silvery pubescence. Clypeus with a median ridge and produced into a small conic median tooth at apex. Mandibles black, the basal two-thirds closely opaquely punctate, the apical half smooth, shining. Palpi brown-black. Antennae 13-

jointed, the flagellum gradually incrassated towards tip; the first joint of the flagellum is scarcely as long as the second, the third and fourth a little longer than the second and stouter, the joints beyond to the 13th gradually shortening, joints 7-10 being transverse; the terminal joint is large, conic-ovate, as long as the three preceding united. Metathorax rugulose with two short median carinae in a slight depression just before the posterior face. Wings hyaline, faintly dusky at apical margins, the tegulae, stigma and veins brown-black, the marginal cell is sublanceolate with the extreme apex truncate and with an appendage; the second submarginal cell is triangular, petiolate, the second recurrent nervure entering it a little beyond the middle. Hind tibial spurs and the three basal joints of tarsi, whitish. Abdomen long, ovate, a little longer than the head and thorax united, subopaque, finely punctate, sericeous, except lateral triangular spaces, separated by a grooved line, on second, third and fourth dorsal segments, which are smooth and shining

Hab.—Haitland, Wisconsin.

Type, No. 3717, U. S. N. M.

Quite distinct from all other species described in this genus by Mr. Fox, by the apical median clypeal tooth.

Prof. Peckham informs me this species preys upon a *Lygaeid* belonging to the genus *Pamera*.

THE LARVA OF CYDOSIA.

It will be remembered by lepidopterists that the position of the genus *Cydosis* Westw., has been in dispute. In Smith's list of 1891, it appears in a subfamily *Cydosiinae* of *Arctiidae*. I have just learned from my friend Mrs. E. M. Swainson that she has discovered the larva in Jamaica, and she sends me some notes on the subject, along with a specimen of the moth. The particular spe-

cies sent—the only one known to occur in Jamaica—is *C. submutata* (Walk.) Ckll., Journ. Inst. Jamaica, 1893, p. 259 (= *C. jamaicensis* Ckll., Journ. Inst. Jamaica, 1892, p. 135, = *C. nobilitella* (not Cram.) Butler ex err., P. Z. S., 1878, p. 495). I give the account of the larva in Mrs. Swainson's own words:—"A pretty half looper larva, one inch and a half long, soft velvety black with orange marks all down back and at sides, between these are tiny pale yellow marks, on

the third, fourth and fifth segments are only tiny orange marks, and on the third segment four shining black spines, the fourth and fifth segments have only two spines each, on all the rest of the body are very fine black hairs; face and legs black with orange marks. When quite young the pale yellow marks are white. When touched the larvae curl themselves up and drop to the ground. On June 18th turned to chrysalis in earth; a pretty chestnut brown [chrysalis], short and fat. On June 30th the moth emerged. Food plant 'worm weed.' (E. M. Swainson.) The food plant mentioned is most likely *Spigelia anthelmia* L. (Loganiaceae).

The most interesting feature of the larva, as brought out in the above notes, is the development of spines in addition to the hairs. It is to be hoped that a detailed account can be obtained later on.

T. D. A. Cockerell.
Mesilla, N. M. July 31, 1897.

BIBLIOGRAPHICAL NOTES. — VIII. *

BY SAMUEL HENSHAW.

BIOLOGIA CENTRALI-AMERICANA. — ARACHNIDA ACARIDEA. By Otto Stoll. 1886-93, pp. 21+55, plates 1-21.

Trombidium, p. 1-6, pls. 1-4;	8 sp. nov.
Rhyncholophus, p. 6, pl. 4;	1 " "
Actineda, p. 7-8, pl. 5;	3 " "
Tetranychus, p. 8, pl. 6;	1 " "
Atax, p. 9-11, pls 7-10;	3 " "
1 var. nov.	

Nesaea, p. 11-13, pls. 10-11;	2 sp. nov.
Limnesia, p. 13-15, pls. 7-9;	4 " "
Bdella, p. 15-17, pl. 3;	1 " "
Scyphius, p. 17, pl. 6;	1 " "
Ixodes, p. 18, pls. 13-14;	1 " "
Amblyomma, p. 19-24, pls. 12, 14;	4 " "
Oribata, p. 24-26, pl. 15;	2 " "
Hoplophora, p. 27, pl. 15;	1 " "
Nicoletiella, p. 27-28, pl. 16;	1 " "
Uropoda, p. 28-31, pls. 16, 17;	5 " "
Megisthanus, p. 31-34, pls. 18-19;	2 sp. 1 sp. nov.
Celaenopsis, p. 35-37, pls. 16, 19-20;	2 sp. nov.
Pachylaelaps, p. 37-38, pl. 19;	1 var. nov.
Holastaspis, p. 39, pl. 20;	1 sp.
Megninia, p. 40-41, pl. 21;	1 sp. nov.
Pterolichus, p. 41-42, pl. 21;	1 " "
Proctophyllodes, p. 42-43, pl. 21;	1 " "

The fifty-five (55) species of Acaridea hitherto described from Mexico and Central America belong to eleven (11) families and twenty-four (24) genera, as follows:—

Trombididae, 2 genera,	9 species.
Actinedidae, 1 genus,	1 " "
Tetranychidae, 1 " "	2 " "
Hydrachnidae, 3 genera,	9 " "
Bdellidae, 1 genus,	1 " "
Eupodidae, 1 " "	1 " "
Ixodidae, 4 genera,	13 " "
Oribatidae, 2 " "	3 " "
Nicoletiellidae, 1 genus,	3 " "
Gamasidae, 5 genera,	12 " "
Sarcoptidae, 3	3 " "

* For VII, see v. 7 p. 425.

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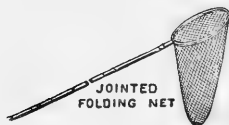
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 - U. S. Entomological Commission.—Fourth Report, Washington, 1885 2.00
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NOTES ON SOME EUROPEAN HYMENOPTEROUS PARASITES OF THE HESSIAN-FLY, *CECIDOMYIA DESTRUCTOR* SAY, AND OTHER INSECTS; BRED BY DR. PAUL MARCHAL, THE FRENCH GOVERNMENT ENTOMOLOGIST.

BY WILLIAM H. ASHMEAD.

Assistant Curator, Department of Insects, U. S. National Museum, Washington, D. C.

(Paper No. 1.)

In 1895 and during the year 1896 I received several sendings of most interesting Hymenopterous parasites, for determination, from Dr. Paul Marchal, the well-known French Government entomologist, of the Paris Entomological Station.

All or nearly all of these parasites were bred material and are of great biologic interest, since a few are apparently new to science, and the hosts of many others will now for the first time be made known.

It is important, therefore, on account of the economic importance of many of the species, that the new species be described and that all should be put on record, for the benefit of those interested in these insects.

Below I have therefore given descriptions of the new species, and as briefly as possible, the hosts and relationship of the different parasites.

In recording these rearings by Dr. Marchal, I shall begin with the European parasites bred from the Hessian-

fly, *Cecidomyia destructor* Say, and the Wheat-fly, *Cecidomyia avenae* Marchal, since these are of the greatest economic importance.

Host 1. **Cecidomyia destructor** Say.

- (1) *Boeotomus (Micromelus) rufomaculatus* Walk. ♀.
- (2) *Merisus destructor* Say ♂ ♀.
- (3) *Boeotomus coxalis* n. sp.

Winged form. ♀ Length 2 mm. Bronzed green, brighter on mesonotum, the head, thorax beneath and metathorax purplish or blue-green, somewhat coarsely squameously punctate; palpi white; scape of antennae except apically and legs, except coxae, brownish-yellow, knees, tips of tibiae and tarsi, except last joint, and tegulae yellowish-white; flagellum brown, subclavate, pubescent. Head transverse, wider than the thorax, about $3\frac{1}{2}$ times as wide as thick antero-posteriorly; eyes rather large oval. Antennae 13-jointed with 2 minute ring-joints, inserted slightly below the middle of the face, but above an imaginary line drawn from base of eyes; pedicel obconical; funicle 6-jointed, the joints very slightly shortening but also gradually widening to club, the first

a little longer than thick, the second and third subequal, about as long as thick, the following wider than long; club ovate 3-jointed.

Thorax with the pronotum transversely narrowed, the mesonotum a little more than twice as wide as long, with the parapsidal furrows indicated only anteriorly by two short convergent impressed lines which become obsolete at about the middle of the mesonotum; scutellum convex, with the axillae about as wide from each other as their width at base; metathorax produced into a subglobose neck, with curved lateral folds but without a median carina or spiracular furrows, the spiracles small, rounded. Wings hyaline, the nervures pale yellowish, the marginal and postmarginal veins subequal, one-third longer than the stigmal. Abdomen ovate, scarcely as long as the thorax, the second segment (first body segment) occupying two-fifths of its entire length, with a large fovea at base above, the third segment above one-third the length of the second, the fourth, fifth and sixth very short and gradually shortening, the seventh and eighth much longer.

Bred May, 1895, from infested stalks of wheat collected March 27.

Subapterous form.

♂. Length 1.4 mm. Bronze green, the head in front blue-green; scape and pedicel brownish-yellow, the flagellum filiform, dark brown or brown-black, clothed with a fine pale pubescence; palpi pale; mandibles 4-dentate, ferruginous; legs, except coxae, stramineous; coxae metallic; abdomen aeneous black, brassy towards base.

Head and thorax squameously punctate, the head transverse wider than the thorax, about $3\frac{1}{2}$ times as wide as thick antero-posteriorly, the occiput concave; eyes subovate; antennæ 13-jointed, with 2 ring-joints, inserted near the middle of the face, the scape about half as long as the flagellum, the ped-

icel obconical, a little longer than the ring-joints and the first joint of funicle united, the funicle joints all a little longer than thick, the club ovate, 3-jointed.

Thorax with the parapsidal furrows indicated only anteriorly, the pronotum short, rounded anteriorly; scutellum subconvex, with a subobsolete cross-furrow before apex; metathorax with a subglobose neck, without carinae or spiracular sulci, the spiracles very small. Wings abbreviated, narrowed, not reaching much beyond the middle of the abdomen, the tegulae yellowish. Abdomen broadly oval, polished, impunctate, depressed, wider than thorax and usually but not always truncate at apex, by the retraction of the terminal segments; second segment occupying about half the whole surface or nearly so, the following segments short and gradually shortening toward tip.

Hab.—Poitou and various parts of the Vendée in France.

This has also been bred by Dr. Marchal, from his *Cecidomyia* (*Oligotrophus*) *avenae*, infesting oats.

The species comes nearest to *Bocotomus* (*Merisus*) *subapterus* Riley, but is readily distinguished from it by the metallic coxae, darker flagellum, the longer funicular joints and by its broader more depressed abdomen.

It seems quite distinct from *Merisus microptera* Lind., Bull. Soc. Imp. Nat. Moscow, 1887, p. 182.

(4) *Holcaeus cecidomyiae* n. sp.

♀.—Length 2.5 mm. Head and thorax olive-green, squameously punctate; scape, trochanters, knees, tibiae and tarsi, except last joint honey-yellow; pedicel bluish; flagellum black, clothed with a short, blackish pubescence; wings hyaline; abdomen aeneous, the large second segment, except the apical margin, blue.

Head transverse, wider than the thorax, concave behind, about three times as wide as thick antero-posteriorly, the space between the eyes about twice as wide as the eye or a little more than twice the width of the eye; viewed from in front subtriangular; ocelli reddish, subtriangularly arranged. Antennae inserted on the middle of the face, 13-jointed, with 2 ring-joints, the scape extending to middle ocellus or half as long as the flagellum without the pedicel, the latter obconical, smooth, shorter than the first flagellar joint; flagellum subclavate or gradually incrassated towards tip, clothed with a short rather dense pubescence, the joints delicately fluted, the first joint the longest, less than twice as long as thick, the second a little shorter, the following gradually and imperceptibly shortening so that the last joint is scarcely as long as wide.

Thorax a little more than three times as long as wide at the widest part of the pronotum, rounded anteriorly and with its upper surface narrowed at the middle, the mesonotum as long as wide posteriorly, slightly narrowed anteriorly, with the parapsidal furrows only indicated anteriorly; axillae as wide from each other as their width at base, the scutellum proper convex, longer than wide; metathorax not short, with a distinct median carina, the lateral folds wanting, or at least only indicated by foveae at base, the spiracles not large, rounded, with rather broad sulci behind. Front wings with the nervures pale, the marginal nervure one and a half times as long as the stigmal, or a little longer, the stigmal two-thirds as long as the postmarginal, subclavate, the postmarginal a little shorter than the marginal. Abdomen conic-ovate, as long as the thorax, the second segment the longest, as long as segments 3-5 united, with a large fovea at base above where it unites with the short petiole, and with its posterior margin squarely truncate, segments 3-6, subequal, the 7th longer than the foregoing, the 8th conic.

♂. Coeruleous; tibiae except at both ends

embrowned, the scape yellowish beneath, the flagellum long, filiform, with black pile, all the joints long, cylindrical, the first the longest, as long as the scape, or about 7 times as long as thick, the following very gradually shortening; abdomen oblong, nearly linear, with a large oblong, yellow spot on basal third above; otherwise as in female.

This species was bred by Dr. Marchal, in June, 1895, from *Cecidomyia destructor* Say attacking stems of wheat.

The species comes evidently nearest to *H. torymoides* Thomson, but is readily separated in the ♀ by color, the shorter abdomen, relative length of the segments and by the length of the flagellar joints, while the ♂ is at once distinguished by the very long joints of the flagellum which are clothed with black pile, not white pile as in *H. torymoides*.

(5) *Eupelmus atropurpureus* Dalm. ♂ ♀.

(6) *Polygnotus (Platygaster) zosine* Walk. ♂.

With the above parasites I found also a single male specimen of *Isosoma brevicorne* Walk.

Dr. Marchal also reports *Oscinis pusillus* as occurring in the oat stubble.

Host. 2. *Cecidomyia avenae* Marchal.

(1) *Boetomus coxalis* Ashm. ♂.

(2) *Merisus destructor* Say ♂ ♀.

(3) *Homoporus luniger* Nees ♂ ♀.

(4) *Eupelmus atropurpureus* Dalm.
(= *atrocoeruleus* Thoms.) ♂ ♀.

(5) *Eupelmus degeeri* Dalm. ♀.

(6) *Trichacis (Platygaster) remulus* Walk. ♂ ♀.

(7) *Polygnotus (Platygaster) minutus* Lind. ♂.

(8) *Anaphes pratensis* Först. ♀. (Egg parasite).

With these were also ♂ ♀ specimens of *Isosoma brevicorne* Walker, which must be a gall-maker on the oats.

Most of the above parasites were

bred from their host, occurring in oat stubble, collected in 1894-95, at Poitier and Montreuil. The rearing of *Anaphes pratensis* Förster, is most interesting, since it is without doubt an egg parasite.

Host. 3. *Cecidomyia tritici* Kirby.

(1) *Merisus destructor* Say ♂ ♀.

DIPTERA FROM THE WHITE SANDS, ON THE TULAROSA PLAINS OF SOUTHERN NEW MEXICO.—I.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEXICO.

The Tularosa plains may be roughly described as lying between the Sacramento Mts. on the east, and the San Andres Mts. on the west, and stretching from the Organ Mts. north to the vicinity of White Mt. They are some 80 miles long, by 30 or 40 wide.

In the northwestern extent of these plains there reposes a remarkable and extensive surface deposit of disintegrated and weathered gypsum, covering an area some 35 or 40 miles long by an average width of 10 miles, and varying in depth from a mere crust to ridges piled up 30 ft. above the level of the surrounding plain. This immense deposit is known as the White Sands. The gypsum is pure, without grit, and nearly white, and the banks of it appear from a little distance almost like banks of snow shining in the sun. From the road going up into the Sacramento Mts., in the Rio Tularosa cañon, a

splendid view of this gypsum area is obtainable. A view is had at a point some 1200 ft. above the plain, and although the spectator is then distant at least 30 miles, the effect is striking in the extreme. The vast stretch of sands lies spread out upon the plain in a panorama of billows, and it is hard to resist the impression that one is looking upon a distant arm of the sea, where a high surf is rolling up upon the sandy beach. The San Andres range, lying close by the western edge of the Sands, enhances the effect, and appears like a rocky promontory washed by the waves. When one comes to walk over the Sands, he finds that the immense troughs and billows are real, and the gypsum is seen to assume all the undulations and forms that the winds of the plains are capable of producing.

These Sands are scatteringly covered with a considerable vegetation through-

out their whole extent, so far as I have examined them, and their insect fauna is considerable as may be inferred. The wagon road from Las Cruces or El Paso to the Sacramento Mts. skirts the edge of the Sands for some 10 miles. Some few plants and insects collected along the edge, while passing them, have shown a very large percentage of new forms—new varieties among the plants, and new species among the insects. Such an extensive region, possessing such markedly peculiar characteristics, and unique conditions of environment, must truly have a flora and fauna of its own. The region promises great returns to the investigator of its flora and fauna. But water is extremely scarce in the vicinity, and the heat and glare are almost unbearable in the summer months, so much so that travellers always pass the Sands if possible at night. It therefore requires more than ordinary courage to attempt an investigation at this season. The best months to visit the locality are October and November. Many plants are then to be found in bloom on the Sands, and the heat while still very great is within the limits of endurance.

The present paper is the result of the determination of a small lot of diptera taken by the writer on the edge of the Sands at White Water Holes, and on the plain close by, during a couple of hours collecting on the afternoon of Oct. 6, 1896. White Water Holes, which sometimes contain a brackish water but are often dry, are situated on

the road within a few feet of the high banks which form the edge of the Sands. They are about 7 miles north from Lunas well (Pelman's ranch), and 40 miles from Tularosa.

All specimens with locality White Sands were taken a short distance over the sand hills from White Water Holes, and actually within the area of the Sands. All those with locality White Water Holes were taken on the plain a few yards from the edge of the sands. Not more than a half hour, in the late afternoon, was spent within the limits of the Sands, and the area covered was not more than 100 yards in diameter.

The reader is referred, for other notes on the White Sands, to the writer's second paper on the biogeography of Mexico and the Southwestern U. S. (Trans. Texas Acad. Sci., 1897.)

1. *Paragus bicolor* Fab. var. *testaceus* Meig. Two ♀s, and three ♂s, near edge of Sands, at White Water Holes, Oct. 6. On flowers of *Aster parviflorus* Gray. Length, 5 to 6 mm. All constant in the color of the abdomen. The black is confined to the first segment, and anterior corners of second. The males have the first segment wholly black, but both females have an elongate transverse marking of red on hind margin of first segment in middle. All have at least a brownish trace of the blackish annulus on hind tibiae.

Williston says that *P. bicolor* has a distinct vertical glabrous stripe on the eyes. It really has three such stripes, the other two being on anterior and

posterior margins of eye, which are bare. The eyes are better described as having two very distinct parallel vertical stripes of pubescence, for the whole glabrous area of each eye is confluent.

I have already recorded this species from New Mexico, from the Mesilla Valley of the Rio Grande at Las Cruces (Trans. Am. Ent. Soc. Mch. 1895). The single female there mentioned, taken August 19, belongs also to the variety *testaceus* (as Snow later stated in Kans. Univ. Quart. April, 1895).

2. *Paragus tibialis* Fall. var. *dimidiatus* Lw. One ♀, and four ♂s. Near edge of sands, at White Water Holes, Oct. 6. On flowers of *Aster parviflorus* Gray. Length, $3\frac{1}{2}$ to nearly 5 mm. The vertical triangle of ♂ is about twice as long as greatest width. In the preceding specimens of *P. bicolor* var. *testaceus*, it is about three times as long as greatest width. I believe that the American forms are to be classed with the European varieties. But the European form with only the first two segments of abdomen black and tip with or without black, according to Schiner who paid particular attention to these varieties, possesses no distinctive name. At least Schiner gives none. Loew, however, described this form as *dimidiatus*, except that he included with it a ♀ of the typical form, which is distinguished by having no red on the abdomen. I think it will be permissible, therefore,

to use Loew's name for this variety, with the abdomen red except first and second segments.

The above specimens are moderately constant. The ♀ has the first two segments completely greenish-black. The ♂s all have the hind border of second segment red, sometimes widely so, one ♂ having second segment only narrowly black on front border. The ♀ has tip of abdomen, being last half of fifth segments and all of rest, blackish. The ♂s have only a brownish tinge on last half of fourth, and anterior margin of fifth segments. Femora all black, except yellow tips.

This is the first record of this species from New Mexico. It is recorded from Colorado on the north, and Sonora on the south.

3. *Zodion fulvifrons* Say var. *abdominale* Say. One ♀. Near edge of Sands, at White Water Holes, Oct. 6. On flowers of *Aster parviflorus* Gray. Length, 6 mm. Front silvery along orbits, yellow, reddish-yellow at vertex. First two antennal joints and upper side of femora tinged with brownish. The third or median narrower brown vitta present. Second and sixth abdominal segments yellowish, with a median reddish line, rest brownish. All silvery pollinose, except median line of sixth segment. Pair of median stripes indistinct, but traceable on third and fourth segments. (See paper on Dipt. Organ Mts., for further notes on this variety.)

BIBLIOGRAPHICAL NOTES.—IX.

BY SAMUEL HENSHAW.

BIOLOGIA CENTRALI-AMERICANA.—COLEOPTERA. VOL. II, pt. 2, PECTINICORNIA AND LAMELICORNIA. By Henry Walter Bates.

	gen.	sp.
Lucanidae, 1886, pt. 47, p. 1-2 ; 1889, pt. 79, p. 382.	3	5
Passalidae, 1886, pt. 47, p. 2-24 ; 1889, pt. 79, 81, p. 383-385.	27	67
Copridae, 1887, pt. 58-60, p. 25-83 ; 1889, pt. 81, p. 385-391.	18	172
Aphodiidae, 1887, pt. 60-61, p. 83-104 ; 1889, pt. 81, p. 391-394.	6	67
Orphnidae, 1887, pt. 62, p. 105-107 ; 1889, pt. 81, p. 394.	2	9
Hybosoridae, 1887, pt. 62, p. 107-108.	1	2
Geotrupidae, 1887, pt. 63, p. 108-115 ; 1889, pt. 81, p. 394-395.	3	18
Trogidae, 1887, pt. 62-63, p. 116-129 ; 1889, pt. 81, p. 395.	4	33
Aclopidae, 1887, pt. 63, p. 129-130.	1	1
Chasmatopteridae, 1887, pt. 63, p. 130 ; 1889, pt. 81, p. 396.	1	1
Melolonthidae, 1887-88, pt. 63-67, p. 130-215 ; 1889, pt. 81, p. 396-405.	16	276
Rutelidae, 1888, pt. 67-69, p. 216-296 ; 1889, pt. 81, p. 405-412.	31	230
Dynastidae, 1888-89, pt. 69-74, p. 296-342 ; 1889, pt. 81, p. 412-414.	25	110
Cetoniidae, 1889, pt. 74, p. 343-376 ; pt. 81, p. 414-416.	14	99
Trichiidae, 1889, pt. 79, p. 377-381.	5	11

Species of the following genera are figured :
Lucanidae.—*Aesalus*, 1. *Cantharolethrus*, 1.
Passalidae.—*Neleus*, 1. *Oileus*, 1. *Oxyges*, 1. *Phoroneus*, 1. **Platyverres*, 1. *Popilius*, 1. *Proculejus*, 1. *Pseudacanthus*, 1. *Rhodocanthopis*, 1. *Soranus*, 1. **Triaenurgus*, 1. *Verres*, 1. *Vetunius*, 1.

<i>Copridae</i> .—* <i>Agamopus</i> , 2. <i>Aphengium</i> , 2. <i>Canthidium</i> , 3. <i>Canthon</i> , 2. <i>Chaeridium</i> , 2. <i>Copris</i> , 3. <i>Deltochilum</i> , 2. <i>Eurysternus</i> , 2. <i>Megathopa</i> , 2. <i>Oniticellus</i> , 6, 24. <i>Ontherus</i> , 3. <i>Onthophagus</i> , 5, 6, 24. <i>Phanaeus</i> , 3, 4, 24. <i>Pinotus</i> , 3. <i>Scatimus</i> , 2. <i>Uroxys</i> , 2.
<i>Aphodiidae</i> .— <i>Aphodius</i> , 6, 24. <i>Ataenius</i> , 6. <i>Euparia</i> , 6. <i>Saprosites</i> , 6.
<i>Orphnidae</i> .— <i>Aegidium</i> , 7. <i>Ochodaerus</i> , 7.
<i>Hybosoridae</i> .— <i>Coelodes</i> , 7.
<i>Geotrupidae</i> .— <i>Athyreus</i> , 7. <i>Bolboceras</i> , 7. <i>Geotrupes</i> , 7.
<i>Trogidae</i> .— <i>Acanthocerus</i> , 7. <i>Anaides</i> , 7. <i>Cloeotus</i> , 7. <i>Trox</i> , 7.
<i>Aclopidae</i> .—* <i>Aporolus</i> , 8.
<i>Chasmatopteridae</i> .— <i>Chnaumanthus</i> , 8.
<i>Melolonthidae</i> .— <i>Barybas</i> , 9. * <i>Chirodines</i> , 10. <i>Chlaenobia</i> , 10. <i>Diplotaxis</i> , 9, 24. <i>Eugastera</i> , 11. <i>Faula</i> , 8. <i>Hoplia</i> , 8. <i>Isonychus</i> , 9. <i>Lachnosterna</i> , 11, 24. <i>Liogenys</i> , 9. <i>Listrochelus</i> , 10. <i>Macroductylus</i> , 8, 9. <i>Phytalus</i> , 10, 24. <i>Polyphylla</i> , 11. <i>Pseudoserica</i> , 9.
<i>Rutelidae</i> .— <i>Anomala</i> , 12, 13, 14. <i>Antichira</i> , 15. <i>Bolax</i> , 17. <i>Byrsopolis</i> , 17. <i>Callirhinus</i> , 14. <i>Calomacraspis</i> , 15. <i>Chlorota</i> , 15. <i>Chrycina</i> , 24. <i>Cnemida</i> , 15. <i>Cotalpa</i> , 16. * <i>Dilophochila</i> , 14. <i>Epectinaspis</i> , 14. <i>Heterosternus</i> , 16. <i>Lagochile</i> , 15. <i>Leucothyreus</i> , 17. <i>Macropoides</i> , 16. * <i>Parachrycina</i> , 16. * <i>Parisolea</i> , 17. <i>Pelidnota</i> , 15, 16. <i>Phalangogonia</i> , 17. <i>Phyllopertha</i> , 12. <i>Platycoelia</i> , 17. * <i>Platyrutela</i> , 15. <i>Plusiotis</i> , 16, 24. * <i>Ptenomela</i> , 15. <i>Rutela</i> , 15. <i>Rutelisca</i> , 15. <i>Spodochlamys</i> , 17. <i>Strigoderma</i> , 14. <i>Thyridium</i> , 15.
<i>Dynastidae</i> .— <i>Amblyodus</i> , 21. <i>Ancognatha</i> , 17. * <i>Aspidolea</i> , 17. <i>Bothynus</i> , 18. <i>Cheiroplatys</i> , 18. <i>Cyclocephala</i> , 17, 18. <i>Daemonoplus</i> , 19. <i>Dynastes</i> , 20. <i>Dyscinetus</i> , 18. <i>Enema</i> , 19. * <i>Euethela</i> , 18. <i>Golofa</i> , 20. <i>Heterogomphus</i> , 19. <i>Ligyrrus</i> , 18. <i>Lycomedes</i> , 21. <i>Megaceras</i> , 19. * <i>Metapachylus</i> , 24. <i>Phileurus</i> , 20, 21. <i>Podischnus</i> , 19, 20. <i>Strategus</i> , 19. <i>Xyloryctes</i> , 18, 19.
<i>Cetoniidae</i> .— <i>Amithao</i> , 21, 22. <i>Argyripa</i> ,

21, 22. *Chiriquibia, 22. *Chlorizanthé, 21. Cotinis, 21, 22, 24. Euphoria, 23. Genuchinus, 23. Gymnetis, 21, 22, 23.

Trichiidae.—Coelocratus, 23. Dialithus, 23. Trigonopeltastes, 23.

New genera are marked (*); the figure following the name of the genus indicates the number of the plate.

The total number of species enumerated is 1,101 contained in 157 genera; more than 100 of the species are unnamed owing to the insufficiency of the material. Seventy-three of the species found in the Central American fauna occur also in America north of Mexico.

Correction.—In the last number of *Psyche*, p. 131, col. 2, last line of text but two, for 3 species, read 1 species.

TWO FORMS OF PRODOXUS COLORADENSIS RILEY.

THE two forms here described were taken by Mr. R. R. Larkin on flowers of *Yucca*, in company with the type form, in April, near the N. M. Agricultural College, Mesilla Valley, New Mexico. Their description as varieties will probably prevent them from being regarded as distinct species by those who may receive specimens without knowledge of the circumstances under which they occurred.

(1.) *Prodoxus coloradensis* var. n. *lautus*. Differs from the type in being white, with only indistinct traces of the black markings on the primaries. Of these markings, the marginal-band and the Y-mark are usually most distinctly traceable. The insect appears at first sight either white, or white slightly clouded with grey, but on comparison with the typical form it is seen that the markings, so far as traceable, exactly correspond in position.

(2.) *Prodoxus coloradensis* var. n. *confluens*. The two innermost dark bands or primaries

coalesced in such a manner as to form a Λ , so that the dark markings of the wing consist of the marginal band, and two Υ s, one inverted, the other, as in the type, in the ordinary position.

T. D. A. Cockerell.

Mesilla, N. M., Sept. 7, 1897.

WEED'S LIFE HISTORIES.

Books about insects for the ordinary reader are not common in America, and when one appears which is simple, straightforward and correct, and especially if it deals with the creatures in all their stages, we are glad to welcome it. Such is *Weed's Life Histories of American Insects*, just published by Macmillan for \$1.50. The sketches are mostly short and unrelated, so that the book may be taken up at any point without missing connections, but it is suggestive of a vast deal more to learn and it is generally accurate and well presented. We notice only one bad slip, where a *Locustarian* is figured as a "leaf-insect"—which it certainly is, leaf-insects occurring in several groups, but the only reference to leaf-insects in the text is on the page facing this cut, where the *Phasmids* are said to be "composed of the walking-sticks and the leaf-insects." There are over a hundred illustrations.

PROCEEDINGS OF THE CLUB.

8 October, 1897. The 197th meeting was held at 156 Brattle St., Mr. S. Henshaw in the chair. Mr. J. W. Folsom was chosen secretary *pro tem*.

Mr. S. H. Scudder showed specimens of the huge *Brachystola magna* from Mexico, collected a year or two ago by Dr. Edward Palmer in Durango. Dr. Palmer writes that they are sometimes very destructive to corn and beans, and if there is a deficiency of rain when the plants are young these grasshoppers feed on them because the grass is tough. At the village of Magdalena, he adds, "I saw a

procession going from field to field singing and praying that rain might fall so that the corn and beans might grow and that the grass might revive so that the grasshoppers would be diverted from the crops. A picture of a saint was carried at the head of the procession, which was composed entirely of females; the males remained in the village to have games of 'pitch and toss.' "

He further stated that Miss Katherine W. Huston had reported to him the capture of one specimen and the sight of another of *Junonia coenia* at Bristol, Me., during the latter part of last July; there is only one record of a capture further north than this. He also read a letter from Mr. W. T. Bell of Franklin, Penn., giving the names of certain butterflies taken there the past year for the first time. These were given by Mr. Bell as *Thecla henrici*, *T. niphon*, *T. irus*, var. *arsace*, *Lib. bachmanii*, *Colias coesonia*, *Terias nicippe*, and *Papilio ajax*, var. *tetamonides*. A more remarkable case of *Libythea bachmanii* was one seen close at hand by Mr. F. H. Sprague in Wollaston, June 21, 1896; it was, however, not captured; a similar instance was recorded in the current volume of *Psyche*, p. 43.

Messrs. Henshaw and Folsom remarked upon the unhealthy condition of the leaves of maple trees in this vicinity during the early summer, a condition wide spread and notice-

able. The leaves turned brown and withered on certain trees only or on certain parts of trees from no very evident cause. This phenomenon was attributed to loss of water from the punctures of plant lice, which had been unusually abundant antecedent to the discoloration. The remarkably moist season of 1897 is a probable explanation of the abundance of Aphididae and, correlated with this, Coccinellidae were also very numerous, including the large *Anatis 15-punctata* of the maple. It will be advisable, in future years, to spray maple trees just as soon as plant-lice appear upon them in considerable numbers, without waiting until their injuries are seen, because the aphides will then have disappeared.

Mr. Folsom made some remarks upon the anatomy of Collembola and the difficulties attending the dissection of these insects.

Mr. Scudder stated that Mr. J. A. Lintner had sent him for determination a specimen of the tropical cockroach, *Nyctobora holosericea*, which had flown into a house in Albany, N. Y., in September; it was probably imported with bananas. He also exhibited specimens of the large destructive locust of Argentina, *Schistocerca paranensis*, sometimes confounded with *S. peregrina*, which had been sent him by Prof. Lawrence Bruner of Nebraska, now engaged in studying its natural history in the province of Santa Fé.

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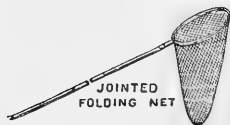
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DIPTERA FROM THE MESILLA VALLEY OF THE RIO GRANDE IN NEW MEXICO.—I.

BY C. H. TYLER TOWNSEND, LAS CRUCES, NEW MEXICO.

This region has been described, in different papers and at different times, both by Professor Cockerell and myself, so that further description here is unnecessary. For information as to its characteristics, reference may be made to my first and second papers on biogeography of Mexico and the southwestern U. S., in the *Transactions of the Texas Academy of Science* (1895-1897).

TABANIDAE.

1. *Tabanus guttatus* Towns.

Syn. *Diachlorus guttatus* Towns. Trans. Kans. Acad. Sci. 25th Ann. Meet. pp. 134-5.

Four ♀s (R. R. Larkin). Las Cruces. Length, $8\frac{3}{4}$ to $10\frac{1}{2}$ mm. This is not a *Diachlorus*. The portion of front between eyes is about $2\frac{1}{2}$ times as long as vertical width, the front, therefore, being comparatively wide. The eyes are distinctly pubescent, but the pubescence is not readily noticed. The front tibiae are but little thicker than the others. It probably belongs in

Osten Sacken's section *Theriopectes*. The above points should be added to my original description. The lateral prolongations of the frontal callosity above are sometimes obsolete, represented only by a brown spot on each side of the small median callosity, which latter may or may not be cut off from the large frontal callosity below it.

SYRPHIDAE.

2. *Paragus tibialis* var. *dimidiatus*

Lev. Six ♂s. Las Cruces, August 21. On flowers of *Aphantostephus arizonicus* Gray. Length, 3 to $4\frac{1}{2}$ mm. Only a faint shade of brown on tip of abdomen, and all with the second segment more or less broadly red behind. Length of the vertical triangle in one or two of the specimens about twice its greatest width (at posterior corners of eyes), but in the others not over one and one-half times. It thus seems certain that this character will not separate the American from the European forms. See paper on White Sands diptera, for notes on this species.

3. *Nausigaster punctulata* Will. One specimen (Ckll.). Rincon, July 5. On *Chilopsis linearis*. See section II of paper on Rio Nautla diptera, for notes on separation of species of this genus.

4. *Melanostoma stegnum* Say. One ♀ (Ckll.). Las Cruces. March 26. On flowers of *Prunus* (plum).

5. *Eupedeas volucris* OS. Five ♀s (Ckll.). Las Cruces. One, March 2, three March 31, and one April 16, on flowers of *Sisymbrium canescens*. Length, 6½ to nearly 9 mm. I have also a ♂ (Ckll.) from Roswell, in the Rio Pecos Valley, taken April 14, on flowers of *Sisymbrium*.

6. *Baccha lemur* OS. One ♀. Las Cruces, August 11. Front and vertex metallic purplish-black, but thorax metallic greenish. Abdomen purplish, of same shade as front.

7. *Volucella comstocki* Will. Three ♂s, and one ♀ (Ckll.). Las Cruces. Two ♂s, March 23; ♀ March 26; one ♂ April 1. All on flowers of *Prunus* (plum). Length, 10 to 11 mm.

CONOPIDAE.

8. *Zodion splendens* Jaenn. One ♂. Las Cruces, August 21. On flowers of *Aphantostephus arizonicus* Gray. This specimen measures but little over 6 mm., yet it is without doubt the same species as another ♂ (Soledad Cañon, Organ Mts.) which measures 11 mm. and is, so far as absolute bulk is concerned, at least five times as large as the present one! The metanotum is shining black in the present specimen, but there

is very little black on the pleurae. Scutellum reddish-yellow. Abdomen same color, with the pollen as described by Williston (in *Z. leucostoma*).

GYMNOSOMATIDAE.

GYMNOSOMA.

The occurrence in New Mexico of the genus *Gymnosoma* has never been recorded, and heretofore had not been suspected. During several of the earlier years of my collecting in that region, I never met with a specimen, and I had come to suppose that the New Mexico region was outside of the faunal limits of the genus, due to the general arid character of the country combined with the elevation. Both *Gymnosoma* and *Cistogaster*, which two genera form the group *Gymnosomatidae*, are preëminently inhabitants of the humid lowlands of temperate North America. They occur plentifully along the Atlantic coast slopes, and in the Mississippi Valley and Great Lakes regions. In this respect they resemble the genus *Trichopoda*, except that the latter is even more highly developed in the tropical lowlands than in the temperate. *Trichopoda*, besides, is strictly American, and most developed in humid coast regions. It seems absent from subarid coast regions, such as the southern portion of Texas between the Rio Nueces and the Rio Grande—the *Costa Deserta* of the old Spanish historians. *Cistogaster* and *Gymnosoma* are both recorded from portions of humid tropical Amer-

ica, but they seem to be of far more abundant occurrence in the corresponding temperate portions of North America. *Cistogaster* has been recorded from Colorado, but probably not from a great elevation.

I was, therefore, much surprised when, in August, 1894, Professor Cockerell showed me a specimen of *Gymnosoma* which he had just taken at Las Cruces. Several other specimens have been taken in the Mesilla Valley at intervals since; and I secured one in the Sacramento Mts., during a week's collecting there in October, 1896. The Mesilla Valley specimens are noticed in detail below. At best the genus is of rare or infrequent occurrence in New Mexico.

9. *Gymnosoma fuliginosa* Desv. Three ♂s and three ♀s. Las Cruces. One ♀ (Ckll.), August 24, on flowers of *Solidago canadensis*. One ♀ (Wooton), October 4, on flowers of *Bigelovia wrightii*. One ♀ (Ckll.), March 23, and one ♂ (Ckll.) March 26, both on flowers of *Prunus domesticus* (plum). One ♂ (Ckll.), Sept. 12, on flowers of *Bigelovia wrightii*. One ♂ (C. Rhodes), Sept.

The Sept. 12 ♂ measures only $5\frac{1}{2}$ mm., being considerably smaller than the others, and resembles somewhat *G. fliola* Lw., which was originally described from Texas. I am convinced, however, that it is only a small specimen of *fuliginosa*. Loew defined *fliola* as distinguished by its shorter antennae, and it probably must be considered only as a variety of *fuliginosa*.

The present specimen is considerably larger than Loew's measurement, which is 2 lines. The abdominal spots are very small.

Of the other normal-sized specimens, none has the abdominal spots at all enlarged. In one of the ♀s, these spots are very small indeed, while in another they are subobsolete. The ♀s measure $6\frac{1}{2}$ to 7 mm.; the ♂s, $6\frac{1}{2}$ to $6\frac{2}{3}$ mm.

Both sexes of this species have the humeri and pleuræ silvery pollinose. The scutellum is silvery on apex, and slightly so in middle at base. The ♀ is distinguished by rest of thoracic dorsum being shining black. I pointed out the sexual differences, in the Proc. Ent. Soc. Wash. (vol. II, 1891, p. 141), where I stated that the thoracic dorsum of ♀ is wholly black shining, but neglected to add that the humeri are silvery.

The specimen above mentioned from the Sacramento Mts. (a ♂, Rio Tularosa, Oct. 2, on flowers of *Bigelovia graveolens* var. *glabrata*) was taken at an elevation of about 6200 ft. This is, doubtless, the greatest elevation at which any specimen of *Gymnosoma* has ever been taken. The Sacramento Mts. are very humid, far more so than the Mesilla Valley, but at the same time they are much higher. The other specimens, taken at Las Cruces, are from an elevation of about 3800 ft. The difference is thus 2400 ft.

OCYPTERIDAE.

10. *Ocyptera euchenor* Walk. A

surprising find, made by Prof. Cockerell during the summer of 1897, is a specimen of this species, taken in the Mesilla Valley, on *Bigelovia wrightii*, August 5. It is the first specimen of the genus ever taken in New Mexico, to my knowledge.

TACHINIDAE s. str.

11. *Jurinia lateralis* Mcq. Two

♂s (Ckll.), Las Cruces, May 3 and June 9. The former is an undersized specimen, with the abdomen less red on sides.

12. *Gonia sequex* Will. Two specimens (Ckll.), Las Cruces. One April 9, on flowers of *Prunus domesticus* (plum); the other, May 5.

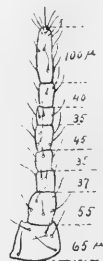
A NEW ANT-NEST COCCID.

BY GEO. B. KING, LAWRENCE, MASS., AND J. D. TINSLEY, MESILLA PARK, N. MEX.

The species described below was collected by Mr. King. The notes on the microscopical characters were prepared by Mr. King, but have been extended and rewritten from Mr. King's mounts by Prof. Tinsley, who is also responsible for the comparison with allied species. The drawings are by Mr. Tinsley. The notes on the living insect, and habits, etc., are by Mr. King.

Dactylopius claviger, n. sp.—Adult ♀. Length 2.5–3.5 mm. Width about 2 mm. Shape, ovoidal, quite plump. Color, dark reddish-brown, covered with white mealy secretion. Segmentation of body distinct, under hand lens. No lateral or caudal appendages. Boiled in caustic potash it colors the liquid a light violet red. Legs and antennae pale yellowish-brown. Antennae 8-jointed; 8 longest, longer than 6+7, and with several whorls of hairs, the hairs being numerous at the distal end; 1 next longest, its diameter equalling or slightly exceeding its length, a whorl of hairs around its distal end; 2 next, its diameter about $\frac{3}{4}$ of its length, two whorls of hairs, one about midway and the other near distal

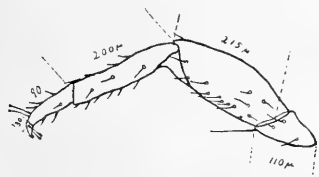
end; 5 next, with two whorls of hairs, one at each end; 7 next, with a whorl of hairs about its middle, 3 next (3 and 7 are often subequal), its diameter being about $\frac{2}{3}$ of that of 2, a whorl of hairs about its middle; 4 and 6 about subequal and with a whorl of hairs about the middle. The joint between 4 and 5 is often, almost usually, quite indistinct, and this might be considered a prominent characteristic. Antennal formula 812573 (46). See figure of antenna. Legs,—



Antenna, $\times 100$.

Femur stout, being a little over twice as long as wide, quite hairy; tibia, width about $\frac{1}{2}$ the width of the femur, length about equal

to that of femur, bristly; tarsus a little less than $\frac{1}{2}$ the length of tibia, bristly; tarsal digitules very long, slender, and knobbed; claw medium size and slightly curved, digitules of claw slightly longer than claw, and



Second leg. $\times 100$.

rather stout. See figure. Anal ring and lobes normal. Ovisac, about 5 mm. long, a

fluffy mass of cottony secretion in which the female often entirely buries herself. Eggs pale yellowish brown.

Male unknown.

Habitat, Andover, Mass., Oct. 20, 1896, in the nest of *Lasius claviger* Rog. Coll. Geo. B. King; collected again by Mr. King at Methuen, Mass., Oct. 3, 1897, in nests of *Lasius americanus* Em., "completely concealed in a round ball of cottony down, attached to roots of grass entering the ants' nest, under a stone" (King).

A striking characteristic of this species is that the antennae and femora bear numerous long, slender hairs and that the body also bears numerous long, slender hairs. The relative lengths of the segments of the antennae are much more constant than is usual in ants' nest coccids.

THE LARVAE OF TWO SATURNIANS.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Hemileuca neumogeni Hy. Edw. — Almost indistinguishable from the eastern *H. maia* except that the head is black. Upper row of spines (1) with short shaft on joints 5-12, an unpaired dorsal spine on joints 12 and 13; none on the anal plate; four rows of spines on joints 2 to 6 and 11, three on the other segments. Secondary hairs abundant, fine, white. Black, head shining; body thickly covered with small yellow dots, approximate, subconfluent, centered by the secondary hairs. An indicated subdorsal, lateral and broader stigmatal yellow bands, showing as dots in the incisures which are mostly otherwise free from the yellow dots. Spines black, the basal ones on each shaft yellowish. Leg plate black; venter a little reddish.

The yellow dots are less confluent than in *H. maia*, being especially sparse in the incisures, and the stigmatal band is reduced and obsolete centrally on the segments.

(1 blown example, Los Angeles Co., Cal. bred by Koebele. Coll. U. S. Nat. Mus.)

Agapema galbina, Clemens. — Egg. Elliptical, flattened above and below, a little concave; white, shagreened, covered all over with a brown gum, which causes the eggs to adhere to the twig and is applied irregularly, forming darker brown spots and streaks. Size, $2.6 \times 1.9 \times 1.6$ mm. Hatch by a hole in one end; laid in an irregular mass on a twig. (H. K. Morrison, Ariz., May 5th, 1883; Coll. U. S. N. M.)

Stage I. Head rounded, black with white setae; width 1 mm. Body black, without secondary hairs, but with four rows on thorax, three elsewhere of low, scarcely produced warts, each bearing several pale hairs mixed with some dark ones. Hairs stiff, somewhat curved. Warts all paired, no single dorsal one, the pair on the anal plate small and rudimentary. Tubercles of equal size, those on joints 4, 5, and 12 scarcely perceptibly larger; anal plate shining; skin faintly transversely wrinkled; no markings; claspers of abdominal feet pale, but leg-plates dark, shining. Length 5 mm.

Large larva. Head 2.8 mm., rounded, black, with many coarse white setae both primary and secondary; small, not as high as joint 2. Body cylindrical, uniform, feet normal. On thorax four tubercles, on abdomen three on each side of each segment, two only on the ninth abdominal, one on the tenth (anal plate), all paired, no median ones. Tubercle i on joints 4, 5, and 12 slightly prominent, the others rounded and about as long as wide, the lower row flat, indicated only by the hairs. They bear few stiff white hairs with black annulus. Skin rather thickly covered with white secondary hairs, less coarse than the primary ones, directed obliquely backward. Color black, a dorsal band of yellow dots each centered by a secondary hair, absent in the incisures; a white subdorsal line (below i) broken into dashes; a wavy substigmatal white line; warts dark red. Many of the secondary hairs arise from faint whitish dots; leg plates reddish black.

Pupa. Head piece with a central ridge; antenna cases large, strongly segmented; abdomen with three moveable incisures, square, subfurcate at tip with two remote clusters of spines. Whole surface coarsely shagreened, the posterior dorsal edges of the abdominal segments also pitted. Color bronzy brown, the incisures blackish. Length 23 mm., width 9 mm.

(Arizona, Koebele collector, coll. U. S. N. M.)

A NEW LECANIUM ON MAGNOLIA FROM FLORIDA.

I. DESCRIPTIVE; BY T. D. A. COCKERELL,
N. M. AGR. EXP. STA.

Lecanium turgidum, n. sp.—♀ scale 5½ mm. long, 4½ wide, 3¼ high. Dark reddish-brown, very shiny, swollen into irregular pustule-like prominences, with large punctiform depressions between.

♀. Boiled in caustic soda, turns the liquid dark sepia, and gives a slight musky odor. Dermis chitinous, orange-brown, not reticulated, presenting numerous small gland spots. Marginal spines excessively minute. Mouth parts very small, rostral loop very short. Antennae very small, short and very stout, bristly at tip, segmentation obscure. Legs, very small and stout. Coxa considerably broader than long; femur very broad, and not much longer than broad; tibia and tarsus also extremely broad; tibia a little longer than tarsus, and about one fourth longer than broad. Claw short and stout, much curved. Digitules comparatively short, filiform.

The embryonic larva is remarkable for the large marginal spines, about 17 on each side.

Hab.—On twigs of *Magnolia glauca*, April 22, 1897, at Lake City, Florida. (Quaintance No. 24). This species is unusually interesting, being intermediate between the subgenus *Eulecanium* of the north, and the peculiar *L. parvicorne* of Florida, which itself exhibits characters transitional to the southwestern subgenus *Tuomeycella*. The depressions of *L. turgidum* correspond to the pits of *parvicorne*.

L. magnoliarum Ckll., found by Mr. Ehrhorn on Magnolia at San José, Calif., is quite different, being 8 mm. long, 4½ wide, and 2½ high, with 8-jointed antennae, formula 3 (451) (28) 67 varying to 3 (41) 52 (86) 7.

II. BIOLOGICAL; BY A. L. QUAINANCE,
FLA. AGR. EXP. STA.

Lecanium turgidum is quite common on both *Magnolia glauca* and *M. grandiflora* at Lake City. The young appear during April in considerable numbers. These crawl out on the new wood and leaves of infested branches, frequently almost covering them. Proportionately few of these reach maturity, however, as they are attacked by a number of parasites. The life cycle appears to be about one year.

NOTE ON LARVAE OF GYNAEPHORA
GROENLANDICA AND G. ROSSII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

IN PSYCHE vii, 328 I referred to Curtis' description of the larva of *Larva rossii* and to the fact that it did not correspond with the larva of *rossii* which I found on the summit of Mt. Washington. The U. S. National museum has just received two larvae from West Greenland, north of Wilcox Head, collected by R. Stein, which agree with Curtis' brief description. One had pupated and I obtained from it a moth of *G. groenlandica*.

Therefore Curtis must have mixed the species, describing the moth of *rossii* and larva of *groenlandica*. Apparently both species occur in Greenland. The museum has specimens of *rossii* from the Florence Arctic expedition and *groenlandica* from Polaris Bay. The species are probably not coextensive, however, as only *rossii* has been taken on Mt. Washington. We have it also from Labrador and Point Barrow, Alaska (Murdock). As to the larva described by Dr. Packard, his "half grown larva" is probably *groenlandica*; the "full fed" one is unlike either.

Larva of G. groenlandica: Head 3.4 mm. wide (male), rounded, dull black, densely covered with long secondary black hairs. Body entirely black, the warts large and granular, arrangement apparently normal with i and iv small, but I cannot see them distinctly in the shrunken specimens. Retractable tubercles on joints 10 and 11 whitish. Hair abundant, dull reddish brown, mixed with black. Dorsal tufts present on joints 5 to 9 and 12 as in *D. selenitica*, but those on 5, 6 and 12 black, on 7, 8 and 9 deep orange. The black tufts are a little longest, projecting beyond the orange hairs and a little beyond the average of the general dorsal coating. Hairs all finely spinulated none plumed.

The smaller specimen has the head 2.5 mm. wide.

The pupa resembles that of *rossii*, but the long dorsal hair is more erect and black, not whitish; the shell is thicker, black, and possesses three pair of long but functionless appendages in the place of the abdominal legs of joints 8 to 10 which I do not find in the pupa of *rossii*.

DATES OF ISSUE OF SOME OF BOIS-
DUVAL'S WORKS.

BY SAMUEL H. SCUDDER.

THE following data regarding the time of issue of some of the works of the French entomologist, Jean Baptiste Alphonse Boisduval d'Echaffour (b. 1801, d. 1879) may prove of interest to special students. They were partly gleaned from different sources in Paris many years ago, partly obtained by reference to the Bibliographie de la France.

The Icones historiques des Lépidoptères d'Europe appeared in 42 livraisons between 1832 and 1843, according to Hagen. The Prospectus was issued March 17, 1832. The separate livraisons contained each, as far as I have discovered, from 8-20 pp. of text and 2 plates. Livr. 1, 2 appeared Mar. 24, 1832; 3, 4, Mar. 31, 1832; 5, 6, July 7, 1832; 7, 8, Oct. 13, 1832; 9, 10, Jan. 5, 1833; (11-18 not discovered, but doubtless in 1833); 19, 20, Jan. 4, 1834; 21, 22, July 26, 1834; 23, 24, May 17, 1834; 25, 26, 27, 28, July 26, 1834; 29, 30, Sept. 27, 1834; 31, 32, Jan. 17, 1835; of the remainder I have no memoranda, except that livr. 38 was published in the last quarter of 1835. After 1835 there is no mention of it in the Bibliographie de la France.

The Europaeorum Lepidopterorum index methodicus appeared Nov. 22, 1828; it is given as 1829 in Hagen. The 2d ed., entitled Genera et index methodicus europaeorum Lepidopterorum, appeared May 9, 1840.

The Faune entomologique de Madagascar appeared Sept. 28, 1833; given by Hagen as 1834.

The Faune entomologique des environs de Paris appeared Sept. 26, 1835.

The Faune de l'Océanie appeared May 9, 1835.

Of the Species général des Lépidoptères, the first two livraisons appeared April 10, 1836.

Boisduval and LeConté's Histoire générale et iconographie des Lépidoptères et des chenilles de l'Amérique septentrionale appeared in 26 livraisons and then terminated abruptly. The first eight livraisons were published in 1829-1830; there was then a break, and the remainder were issued in 1833-1834. The livraisons were made up as follows, and I have added the exact dates of four of them:

- 1 (p. 1-16; pl. 1-3) May 2, 1829.
- 2 (p. 17-24; pl. 4-6) June 13, 1829.
- 3 (p. 25-32; pl. 7-9).
- 4 (p. 33-40; pl. 10-12).
- 5 (p. 41-48; pl. 13-15).
- 6 (p. 49-56; pl. 16-18).
- 7 (p. 57-64; pl. 19-21).
- 8 (p. 65-80; pl. 22-24).
- 9 (p. 81-88; pl. 25-27) July 27, 1833.
- 10 (p. 89-100; pl. 28-30) " "
- 11 (p. 101-108; pl. 31-33).
- 12 (p. 109-116; pl. 34-36).
- 13 (p. 117-124; pl. 37-39).
- 14 (p. 125-132; pl. 40-42).
- 15 (p. 133-140; pl. 43-45).
- 16 (p. 141-148; pl. 46-48).
- 17 (p. 149-156; pl. 49-51).
- 18 (p. 157-164; pl. 52-54).
- 19 (p. 165-172; pl. 55-57).
- 20 (p. 173-180; pl. 58-60).
- 21 (p. 181-188; pl. 61-63).
- 22 (p. 189-196; pl. 64-66).
- 23 (p. 197-204; pl. 67-69).
- 24 (p. 205-212; pl. 70-72).
- 25 (p. 213-220; pl. 73-75).
- 26 (p. 221-228; pl. 76-78).

A CURIOUS CASE OF PROTECTIVE COLORATION.

AT Mesilla, N. M., on Aug. 15, 1897,

sat down to rest while on a collecting excursion, and my eye fell on a clump of the whitish-green *Baileya multiradiata*, with its splendid orange composite flowers. In the middle of the clump was a vanessid pupa, while resting on one of the stems, about to cast its skin, was a sphingid larva. These objects caused me some surprise, as being (so far as I had yet known) foreign to the *Baileya*, and yet harmonizing perfectly with its peculiar color. The pupa was silver-color with a faint greenish tinge and a golden lustre, with the dorsal prominences and part of the antennal coverings ruddy golden. A beautiful and conspicuous object in the hand, it was hardly noticeable on the plant. So also with the larva, which was 35 mm. long, pale whitish-green, nearly the color of the foliage; caudal horn very pale blue, with dorsal black specks; seven oblique lateral stripes, spiracular openings orange. Taking the larva home, I found that it would by no means eat *Baileya*, but it fed greedily on the foliage of *Solanum elaeagnifolium*. It was, in fact, an immature "tomato worm." The pupa, on Aug. 21, gave forth an ordinary example of *Pyrameis cardui*; the larva must doubtless have wandered from an adjacent *Sphaeralcea*.

Now are we to suppose that the vanessid larva came to the *Baileya* to pupate, and the sphingid to exuviate, because they realized that they would be protected (*i. e.* inconspicuous) there?

T. D. A. Cockerell.

Mesilla, N. M., Sept. 7, 1897.

NOTE ON CYDOSIINAE.

IN VIEW of Mr. Cockerell's note on the larva of *Cydosia* (*Psyche* VIII., 130) we have now at least a partial idea of the young stages of both genera of the *Cydosiinae* of Smith. Messrs. Hulst and Smith have both remarked on stage I. of *Cerathosia* (*Ent. Amer. V.* 48-9), but between the two accounts the essential features seem to have become befogged. The specimens are now before

me. The egg is noctuid and the larva a true semi-looping noctuid in primitive first stage, the single setae stiff, bulbous at tip, perfectly normal and the subprimaries absent. The larva is excluded from both Arctians and Lithosians by the bulbous setae, as Dr. Packard has shown that no Arctian has glandular hairs. Further the thoracic tubercles remove it from the Lithosians. Again the shortening of the first two pair of abdominal feet never occurs in the Arctian phylum, but is characteristic of the semilooping Noctuids.

It seems evident that the Cydosiinae are Noctuids, the character of vein 8 of secondaries being here deceptive, but paralleled in some species of Acontia in the Noctuidae, as I have had occasion to notice.

Harrison G. Dyar,

NOTES ON UNUSUAL FOOD PLANTS, ETC.

THIS autumn Miss Eliot and I found in Nonquitt, Mass., six larvae of *Smerinthus*

astylus on *Andromeda ligustrina*. We had never been able to make them eat anything except *Vaccinium corymbosum* and *Gaylussacia frondosa*. We found also *Samia cecropia* on *Gaylussacia frondosa*; *Eacles imperialis* on *Prunus serotina*; *Smerinthus myops* on birch, willow, and poplar; *Datana drexellii* on *Hamamelis*; *S. gordius* on *Andromeda ligustrina*; *S. excoecatus* on *Spiraea salicifolia*; *H. io* on *Trifolium repens*; *E. chœrilus* on *Kalmia augustifolia*.

We found one larva of *Smerinthus myops* having the spots of a clear mauve color instead of red or brown; and a larva of *H. thisbe* all red except the dorsal area and first segment.

We found on elder a large sphinx larva of a chocolate brown with obliques and face lines of paler brown, like *S. chersis* except in color. This had been hurt in some way and died.

Caroline G. Soule.

187 Walnut St., Brookline, Mass.
October 2, 1897.

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PSYCHE,

A JOURNAL OF ENTOMOLOGY.

[Established in 1874.]

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PSYCHE.

GEORGE HENRY HORN.

GEORGE HENRY HORN, President of the American entomological society, died at Beesley's Point, N. J., November 24, 1897. He was born April 7, 1840, at Philadelphia. After attending the Central High School he entered the University of Pennsylvania, graduating in medicine in 1861. From 1862-1866 Dr. Horn was a surgeon in the United States army serving in California, Arizona, and New Mexico; here he gathered large collections especially in Coleoptera. On his return to Philadelphia Dr. Horn entered upon the practice of his profession; his skill in obstetrics soon brought him a large clientele. A few years ago he gave up active practice. Dr. Horn visited Europe on several occasions, and made a trip to California in 1893; with these exceptions his life was practically passed in Philadelphia, where he was active in scientific circles through his connection with the American entomological society, the Academy of natural sciences, and the American philosophical society; of the last he was librarian and one of the secretaries at the time of his death. Though nominally connected with the University of Pennsylvania, since 1890, as Professor of entomology, he never taught. Dr.

Horn was a charter member of the Entomological society of Philadelphia, the predecessor of the American entomological society, and an honorary or corresponding member of various entomological societies the world over. His collection and library, together with a modest sum of money, were bequeathed to the American entomological society. A physician by profession Dr. Horn was even earlier a naturalist. Before graduating from the medical school he had published a few papers on recent and fossil corals; the influence of Prof. Joseph Leidy, however, turned his attention to entomology, while the advice and friendship of Dr. John L. Leconte led him to devote himself to the study of the Coleoptera of Boreal America. He was distinctly Leconte's pupil, working in cooperation with him for many years, and, since 1883, easily the most eminent investigator in his chosen line of work; but few of his studies concerned extralimital forms, and though several were devoted to the habits and early stages, and at least one to fossil forms, his work deals almost entirely with North American Coleopterozoology from a systematic, descriptive standpoint. His

first entomological paper was entitled 'Descriptions of new North American Coleoptera in the cabinet of the Entomological society of Philadelphia' and was published in the Proc. acad. nat. sci. Phila., for 1860, p. 569-571. In the beginning his original work shows unmistakably his inexperience, but his great keenness and a true appreciation of the structural differences that characterize species soon became manifest, and is evident in most of his future publications. Dr. Horn was a rapid, accurate worker, a painstaking and careful delineator. His contributions number more than 150 important papers, in addition to very many minor notes; in these papers about 150 genera and more than 1550 species are defined, and very few

in either series are to be ranked as synonyms.

With but little interest in, and hardly enough appreciation or even toleration for, many lines of study, Horn's monographic work stands with the very best of his time, and though the death of Leconte, in 1883, was considered a calamity to his special branch of science, it may well be doubted if the death of Horn in 1897 is not a greater loss. Leconte left a well-equipped successor in Horn, but the successor of Horn is not yet apparent, and to be worthy of the place must follow closely along the lines so clearly marked out by the well-directed labors of John Lawrence Leconte and George Henry Horn.

PACIFIC COAST COLLECTING. — I.

BY ALBERT PITTS MORSE, WELLESLEY, MASS.

At the suggestion and with the coöperation of Mr. Samuel H. Scudder of Cambridge, Mass., I undertook last summer a collecting trip to the Pacific Coast of the United States to secure the Orthoptera inhabiting the region between the Sierra Nevada mountains and the sea. At his request I have put together a few notes which may prove of interest to entomologists contemplating a trip to that part of the country.

Of course, so great an extent of territory could be examined but superficially in one summer, but even this had never been done with special reference to the Orthoptera. And although twelve

weeks were devoted to the task it was found impossible to do more than make a cursory examination of the most important points directly on the through line of the railroad, and a few short side-trips to places that promised well. Had it been possible I should have visited several more points situated in less accessible but very interesting localities. The same amount of time could be profitably spent upon a much smaller area. Unless it be necessary to examine, however hastily, a large field the best method is to remain in each locality visited until its various features are adequately covered.

Route. My route was as follows: Leaving Boston July 21 an all too brief stay of a few hours in Washington enabled me to secure valuable suggestions from people more or less familiar with the country to be traversed. From thence my route led by way of Atlanta and New Orleans direct to El Paso, Tex., from which point I paid a short visit to Prof. Cockerell at Mesilla, N. M., in the midst of an exceptionally rich and interesting fauna. Returning to El Paso an all-day ride carried me to Yuma, Ariz., which was reached July 4. From this point northward stops were made at relatively short intervals, effort being made for as great a variety of physical and climatic conditions as possible consistent with economy of time and money, from one to three days being spent in a place with side trips when it seemed advisable. Two months were spent in California, the chief points touched being San Bernardino, Los Angeles, San Diego, Yosemite Valley, San Francisco, and Mt. Shasta. Oregon was reached Sept. 6 and several stops made along the line of the railroad and side-trips to Mary's Peak and Hood River. Washington was barely touched at three points, when, the weather becoming unfavorable, I left the coast Sept. 30, returning via the Canadian Pacific railroad.

Expense. A three months' trip of this kind from Boston back to Boston may be made, with strict economy, for \$400— from New York or Washington proportionately less, — not including transportation to and from the Yosemite

Valley, which would be \$25 to \$35 more. An additional \$50 or \$100 will add greatly to the traveler's comfort and the enjoyment of the trip. The expense of a collecting tour of course depends on the amount and character of the territory examined, the time spent at each stopping-place, and the style of living.

The best ticket is the nine months' "Pacific Coast Excursion," allowing sixty days to reach the coast, and nine months for return to point of departure, with privilege of stop-over within these periods anywhere on the route west of certain points. Tickets for side-trips should not be bought till needed, as advantage may often be taken of temporary reductions. Local railroad fares vary from 3 to 6 cents a mile, stage fares from 10 to 45 cents.

In traveling across the continent a berth in a "Tourist" sleeper (second-class) may be had for about one-third the cost of one in the regular first-class Pullman and is fairly comfortable. Meals en route at hotels and in dining-cars average 75 cents each. Rates at the railroad hotels range from \$2 to \$4 a day. In most towns accommodations may be secured for \$1 to \$1.25 a day. In Los Angeles and San Francisco excellent meals may be had for "two bits" (25 c.). Sometimes high-priced houses have a low rate that may be secured on application. If a stop of several days at a central point is contemplated it is usually best to engage a room by the week and take meals where most convenient. At railroad stations where there are no hotels one may

usually secure meals at least at the section-houses, and if blankets are carried may sleep out with comfort almost anywhere. To reach points in unsettled districts it is often necessary to go with an "outfit" consisting of pack and saddle animals. These, with guides, may generally be secured at hotels or livery stables at prices proportionate to the labor involved and the service rendered, ranging from \$1 to \$5 a day for animals and \$2 to \$10 for guides.

Baggage. This should consist of, 1st, a trunk to contain extra clothing, blankets when not in use, reserve apparatus, supplies, etc., and at times more or less of the material collected (150 lbs. weight free on railroads, — stages and transfers extra); 2nd, a good-sized gripsack or its equivalent to contain clothing and supplies for immediate use, guide-books, maps, etc., — which is usually carried free anywhere and is all that is necessary for short side-trips; 3rd, a collecting-outfit and packing-boxes ready for instant use, — often of service during stops of the train for water, at sidings, and in breakdowns or delays of any description.

Weather. From May 1 to Oct. 1 the weather is very rarely unsuitable for collecting, though near the extreme dates it may be unsettled. On the shore the early morning and late afternoon are quite often foggy. In the mountains showers may occur in any month, but are rare. Rubber wraps and blankets to protect from rain are never carried in summer, but light ones to protect from dust are very desirable,

especially when traveling by team or stage on much-used roads, *e. gr.*, to the Yosemite Valley.

Temperature. To the northerner the climate of southern California in midsummer is liable to prove trying. Personally I felt no inconvenience until the mercury reached 110° to 115° in the shade. In these circumstances everything, even growing plants and substances otherwise invariably cool, was uncomfortably warm to the touch, and the utmost lassitude and indisposition to effort of any kind were felt. This temperature, however, was experienced for but a few days while in the Colorado Desert, and the lassitude may have been partly due to other causes. At 100° to 105° whole days were spent in the field, tramping about and collecting, and though the sun was trying less discomfort was felt than in the sultry heat of the east at 90° .

In the Yosemite Valley the nights, and especially the early mornings, were cold relatively to the rest of the day, but over most of the district traversed there was less diurnal range of temperature than in the east and much less change from day to day.

Clothing. No change in the amount or character of the clothing from that customarily worn in New England was found necessary. Immediately on the shore light-weight woolens were needed. In the interior thinner clothing was more comfortable except at high altitudes. At San Francisco during the latter part of the day and on the ferries a light-weight overcoat was desirable,

owing to the boisterous, fog-laden sea-winds.

The hat to be worn depends largely upon individual preference. The lightest and coolest is the cloth helmet, which is provided with an air-space all about the head, allowing free circulation of air. This does not properly protect the sides of the face and neck, and collapses when wet. A broad-brimmed straw gives more shade and is fairly light but allows less circulation of air about the head and is troublesome to carry when traveling. Cork helmets are durable but undesirably heavy. After wearing a cloth helmet for a week and having it spoiled in a thunder-shower I adopted for steady use the ordinary street hat of the east (straw, — 2½ inch brim) and this notwithstanding the fierce rays of the sun in southern California. This was presentable when traveling, gave sufficient protection from the sun and little resistance to the wind when collecting, was worn throughout the season and is still in good condition. Sunburn was prevented by tying one edge of a handkerchief to the hat-band for a few days. In addition, a soft felt that may be rolled up and put in the pocket was found desirable in the north, in wet weather, and at high altitudes.

Two pairs of shoes are necessary, one for town use and one for tramping. Those for tramping should contain plenty of room for the toes and have thick soles studded with hob-nails, the latter securing greater durability and sureness of footing.

Leggings of stout duck or canvas that buckle closely about the ankle and instep are a valuable addition to the collector's outfit, effectually excluding the dust, protecting the trousers from much wear and the gummy tar-weed, and possibly warding off snake-bite.

Camping. California is the ideal land for camping-out owing to the long rainless summer and dry soil. While ordinarily it will be found economical of time and labor to patronize hotels and lodging-houses there are times when camping can be done to advantage and one who fails to seize the opportunity will miss many enjoyable experiences. A pair of heavy blankets is sufficient for any elevation up to snow line; a single one is often sufficient and sometimes none is needed. While wraps of some kind are usually desirable in the early morning hours, I have slept with comfort in the San Joaquin valley under a tree, and at higher levels by the side of a fire, without any.

Fires for cooking, light, and heat are of course necessary, but the utmost care in their management is imperative owing to the tinder-like dryness of all combustible matter. In every case dry leaves and brush must be removed from all about and in the forest one must dig down through the half-rotted humus to the soil itself in order to prevent the fire from spreading out surreptitiously. Care must be used to put the fire entirely out before moving on.

Canteen. In the hotter districts it is best to carry a canteen if one expects to be away from water for more than an

hour or two. The quart size army canteen will answer for most occasions but for trips of considerable length a more capacious one is necessary. In all cases it should be covered with thick, durable cloth kept wet in order to cool its contents by evaporation.

Collecting apparatus. The collector should start with an abundance of apparatus in the shape of net-frames, nets, cyanide-bottles, etc. At least two net-frames should be carried, and parts especially liable to be broken should be taken in duplicate. Nets are extremely subject to damage owing to the thorny character of much of the vegetation. Pasteboard boxes for packing can be found in quantity in the largest cities only, but used ones (thread, button, knife, etc.) may often be obtained in dry goods and hardware stores. Cotton batting may be found anywhere. Carry cheap envelopes for specimens of plants which it is desirable to determine, and blotting-paper to keep cyanide-bottles dry.

Preservation of material. This is a simple matter owing to the dryness of the atmosphere, the chief precaution necessary being to guard effectually against rough handling. The method followed was one I have used for several years on collecting trips in New England, slightly modified to meet the greater risk of breakage during transportation. The material was simply packed between layers of cotton in pasteboard boxes perforated with numerous holes and with very few exceptions came out in excellent condition.

For several days after packing the boxes were exposed freely to the air by placing them in an extra net hung up in a current or tied to the handle of my grip when traveling. Some large-bodied insects, like *Stenopelmatus*, were opened and stuffed, but this is seldom necessary.

Collecting season of Orthoptera. While the Orthoptera, like other insects, may be obtained at all seasons of the year, there is with them likewise a period when the number of species and individuals in the adult state is greatest and which is consequently the most advantageous season for collecting. For several orders the early summer months are undoubtedly the most favorable time but to this rule the Orthoptera form a notable exception. In the majority of species the winter is passed in the egg stage, the young appear in spring, grow through the summer, and reach maturity in late summer or early fall. In New England the most favorable time for collecting is from mid-July to mid-September, while for most orders it is in June and July. On the Pacific Coast also this rule holds good: in Washington and Oregon the best period will be found in August and September, in California from July to September according to latitude and elevation. This fact of a later collecting season for Orthoptera than for other orders seems to have been overlooked by several collectors and entomologists who were consulted before setting out. As it proved, I was a little early in the southern and late in

the northern parts of the district examined. There are, of course, species that can be obtained only in the spring.

Observations on other orders. To other orders but little attention was paid. The most noticeable in point of numbers were Homoptera and minute Diptera which swarmed at times in thick vegetation and about damp places. Heteroptera and Hymenoptera were occasionally numerous. Several kinds of butterflies, mostly in poor condition, were common in So. Calif., and sometimes favorable localities were found where a few species of Odonata were plentiful. Coleoptera were rather scarce, except occasionally, when certain species were met with in abundance.

Character of collecting. In California, while the extreme conditions accessible are greater, ranging from sub-tropical deserts to glacier-crowned peaks, and this sometimes within a strikingly short distance, yet, as a rule, the collector finds it necessary to travel about more than in the east. This is because the country is laid out on a broader plan and there is less variety in each square mile than in Massachusetts, for instance, where one may often visit woods, fields, streams, peat-bogs, sand-hills, and rocky ledges in an hour's ramble. In California a similar variety in so small compass can rarely be found.

At the time of my visit the conditions over most of the regions examined were those of great aridity, and the larger proportion of the Orthoptera secured belonged to a group partial to such

conditions,—the Oedipodinae. Except where recently irrigated or within a few feet of running water, the soil, even in the forests, was absolutely dry. When of adobe it was sun-baked, extremely hard, and rent with cracks penetrating to a depth of several inches or a foot, affording complete safety to insects taking refuge in them unless the collector were armed with pick and shovel.

The grass was parched and brown and the soil exposed everywhere except along streams and irrigation-ditches and in wet grounds, where a tall, dense growth of grasses and allied plants was found. In consequence grass-loving insects were less numerous and much restricted in area. Alfalfa-fields, irrigated, and looking most attractively green, were not as remunerative collecting grounds for Orthoptera as would be expected. In desert regions many species were found on bushes and weeds. The best localities for securing variety of species were those near water, either streams, springs, or artesian wells and tanks; in such places insects of all orders congregated.

Precautions. Sunburn of face, neck and hands, which may become very painful and interfere with work, must be guarded against until a coating of tan is acquired. Sunstroke is so rare as to be almost unknown; and if the head is kept wet and care used not to become overheated by violent efforts there is no danger. In the hot regions thirst must be constantly kept in mind in wandering to any distance from houses, as even a few hours exposure without water may

involve suffering and serious consequences. The first question to be asked regarding a journey is in respect to where water may be obtained. Keep the mouth shut during exposure and eat juicy fruits, thus lessening the desire for water. In many places the water is more or less alkaline in character (as may be recognized by a slightly sweetish taste) and acts rather powerfully, but the free use of lime-juice, acid phosphate, or fresh acid fruits neutralizes this tendency. The amount of water and juicy fruit that may be consumed without bad results in the dry atmosphere of the southwest is astonishing. People usually lose flesh rapidly during the first few weeks' exposure.

In the hotter regions, when a considerable distance is to be covered, or when climbing mountains, it is advisable to ride if possible, especially if unaccustomed to physical exertion in hot weather. For climbing, choose the coolest part of the day. Snow-covered mountains should on no account be attempted without a companion, preferably a competent guide, as even a slight accident is likely to be followed by serious results. Carry a compass (a watch-charm is sufficient) and use it when on mountains where clouds are liable to form at any time, and in the forest when leaving the trail. Do not go far from a trail unless familiar with the region or provided with a specially developed bump of locality. When at a distance from supplies abstain from consuming the last of either food or water until more is directly at hand, —

unforeseen emergencies may arise. It is desirable to carry lunch on railway journeys as delays are of frequent occurrence. Before setting out on a trip into wild country get all information possible regarding the route, preferably from several persons. Rely upon statements of no single person unless he is thoroughly familiar with the country. Information regarding points along the railroad may often be obtained from train-men, particularly those on freight-trains.

Footsoresness can be prevented by wearing thick-soled shoes, or by a different method of walking, using other muscles and pressing less upon the ball of the foot. Chafing and blisters can be prevented by the use of hard soap moistened and rubbed upon the inside of the socks where needed. This is especially cooling and grateful to feet unaccustomed to the burning soil of the desert regions.

Drying out material. In damp weather and on the sea-coast it may be necessary to dry material by artificial heat. This may be done by hanging the boxes in a net over a lamp or gas-burner. In case mould is feared powdered naphthaline should be sprinkled among the specimens.

Poisonous animals and plants. Mosquitoes are rarely troublesome, only on salt-marshes and about standing water, and a mosquito-curtain is seldom needed. House-flies are abundant and extremely persistent. Fleas are only too common but cannot always be caught when desired. Scorpions are

common and should be kept in mind when handling wood for camp-fires, putting on shoes in camp, examining bark of fallen trees, dead leaves, or rubbish of any kind on the ground. They seem to be attracted to fire at night. Their sting, while painful for a few minutes, affects people differently but seldom produces serious results; immediate application of strong ammonia is recommended. Centipedes two to three inches long were common but did not offer to bite. Tarantulas were not met with. Rattlesnakes, while said to be common, are rarely seen; I met but two in all my rambles. There is a small species, about 16 inches long, found on the Colorado Desert and perhaps elsewhere, called the side-winder, that is more active and quite as deadly as the larger kind, and is generally feared in consequence. One should be cautious when inspecting low bushes and weeds in the desert regions, and should be prepared to treat snake-bite if so unfortunate as to be wounded.

"Poison oak" or ivy (*Rhus*) is very plentiful in certain sections and contact with it should be avoided. Immediate washing after exposure is said to lessen the danger of bad results. In case of poisoning apply a solution of hyposulphite of soda (photographer's "hypo") or weak carbolic acid. Nettles and cacti are also to be shunned.

Preparation. In preparation for

such a trip the intending visitor will find it advantageous to study the topography* of the Pacific Coast states; also, to examine the biologic map of North America published by Dr. Merriam in North American Fauna No. 3, the climatic map of California published by the So. Pac. R. R., and the articles on geographical distribution in North America by Dr. Merriam in the Dept. of Agriculture Year-book for 1894 and North American Fauna No. 3.

For a guide-book Baedeker's United States should be purchased,—this is indispensable. Railroad maps, folders, and illustrated booklets (some of which are very helpful) relating to the Pacific Coast and the routes thereto may be procured from agents of the various transcontinental lines. In addition get Rand, McNally & Co.'s vest-pocket maps of the various States (15c. each,—best thing out for railroad stations and general use). For details of topography there is nothing so good as the few sheets of the topographical map of the United States, published by the U. S. Geol. Survey. These cost but 5c. each and may be had of the Director, at Washington. A knowledge of the right time to go and places to visit can best be secured from one's fellow-specialists. The appended notes on localities may be helpful.

* See "Topography of California" by N. F. Drake, in *Journal of Geology*, Sept.-Oct., 1897.

BRUNNER'S GENUS METALEPTEA.

LINNÉ, Syst. nat., ed. xii, I, ii, 692 (1767), placed in *Acrida* (as a division of *Gryllus*) the species *nasutus*, *turritus*, and *brevicornis*. Fabricius, Syst. entom., 279 (1775) substituted *Truxalis* (as a distinct genus) for *Acrida*, placing in it the species *nasutus* (with *turritus* as variety) and *brevicornis*, the identical species and those only employed by Linné. *Truxalis* alone came into general use; but Stal, Rec. Orthopt., i (1873), first separated the above species into distinct genera, placing in *Acrida* among others the species *turrita* (96) and *nasuta* (99) and in *Tryxalis* the single species *brevicornis* (104). Brunner (Rév. syst. Orthopt. 118, 1893) uses *Tryxalis* for the species placed by Linné and Stal in *Acrida*, and proposes *Metaleptea* for *brevicornis*, but Stal was first on the ground, and Brunner's name must fall as superfluous.

This conclusion was also reached by McNeil in his recent Revision of the *Tryxalinae* (see Proc. Dav. acad. nat. sc., vi, 211.)

S. H. Scudder.

AMOSIA PLEXIPPUS IN AUSTRALIA.

The South Australian Register of Sept. 23, 1897, contains some notes from the entomologist's department of the South Australian museum which announce, among other things, the gift of "the naturalized American butterfly, *Danais erippus*, whose caterpillar or larva feeds exclusively on plants of the family *Asclepiadaceae*, which were, however, originally absent from this part of Australia. Its establishment here, therefore, depends mainly upon that of a Cape plant, the 'cotton bush' (*Gomphocarpum fruticosum*). Both plant and butterfly are now widely distributed in South Australia."

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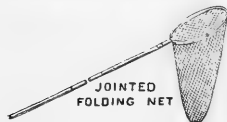
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PSYCHE.

THE LARVAE OF THE AUSTRALIAN EUCLEIDAE.

BY HARRISON G. DYAR, WASHINGTON, D. C.

[Annual address of the retiring president of the Cambridge Entomological Club, 14 January, 1898.]

In looking over the figures of exotic lepidopterous larvae that have been published, I think one of the most curious and apparently inexplicable forms is the *Doratifera vulnerans* of Lewin. This Eucleid is described as possessing the power of everting eight little tufts of stinging spines which are concealed when the larva is not irritated. I was at a loss to imagine the origin or mechanism of this structure and it was therefore with much pleasure that I received from Mr. E. A. C. Olive of Queensland a specimen of a species showing the eversible spines.

The group seems confined to Australia. I have examined the descriptions of the species of India for anything analogous, but without success. The Indian larvae are similar to our own, the *Sisyrosea* type seeming to predominate, with a few *Euclea*-like and smooth forms (the latter not to be interpreted from the figures). There is nothing here to suggest the origin of the peculiar structure of the Australian larvae.

Kirby lists seventeen species of Eucleidae from Australia in eight genera,

of which I have seen figures of five larvae of two genera. When all are known, it may be found that there are other types of larvae, but at present there is no evidence of this. The five figures show a neat gradation in characters, apparently representing one type. The one showing the greatest development of the peculiar eversible spines is Lewin's species. Scott figures four others in which this character gradually declines until the last species is without horns of any kind and has become a "smooth Eucleid." Evidently we have here a new type of smooth Eucleid, different from either of the North American ones, derived, I think, from the true Australian type. Therefore I consider the larva received from Mr. Olive as typical of the Australian Eucleidae.

Before describing the Australian species I will review the types already made known. These are all represented in North America. In Europe there are but two species, both belonging to one limited type which is better represented here. In Asia, Moore has figured a good

many species from India, but the figures are very rough and often inaccurate. In some as many as twenty side horns are shown, although these structures are segmentary and could not possibly exceed twelve (nine is the normal number). The figures serve only to give a general idea of the larvae and in the case of the smooth ones, where the structure is obscure, they are worthless in locating the forms.

The few South American species described belong to types represented with us. Therefore, with the exception of Australia, we have all the types as yet definitely made known.

The structure of the Eucleid larva is to be understood by starting from a larva like the Pyromorphid or European Anthrocerid (Zygaenid) or, still more exactly, the South American Megalopygid which has warts derived from tubercles $i+ii$, iii and $iv+v$. In the Eucleid the subventral area is reduced, owing to the formation of the creeping disk, and all the warts below the stigmatal region are obsolete. This leaves three warts on thorax and two on abdomen for the primitive form.

The warts are variously modified, two main tendencies appearing. First hypertrophy, resulting in appendages or horns as they are variously called (spined Eucleids); second atrophy, resulting in the smooth type.

Type 1 (Tropic hairy Eucleids.). Illustrated by Phobetron and Calybia. Three warts present on the thorax; the warts are hairy, not spined; the first stage shows single setae with an alter-

nation of strong and weak segments which persists in later stages. We have here the original number of warts and a modified primitive first stage, followed by wart formation with relatively unmodified setae. This combination of generalized characters entitles this type to the lowest place. Following up this line of descent we have:—

Types 2 and 3 (Tropic spined Eucleids). Illustrated by Sibine, Euclea etc. Only two warts on thorax, the same as on abdomen. Horns spined, the simple setae present only in stage I and multiple; no sign of alternating weak and strong segments. We have the formation of spiny setae, the number of warts reduced, a crowding back of the simple-haired warts into stage I with loss of the primitive first stage. A distinctly higher type in all the characters enumerated. To this belong many of the Indian and South American species figured by authors.

Type 4 (Tropic smooth Eucleids). Illustrated by Eulimacodes. To return to the starting point for this new phylum there are three warts on the thorax, small warts present in stage I, afterwards single setae only by degeneration. We have atrophy of the warts superimposed upon a crowding back of the wart formation into stage I with loss of the primitive first stage.

Types 5 to 7 (Palaeartic smooth Eucleids). Illustrated by Apoda, Heterogenea and Packardia. The warts are absent, being reduced to single setae by degeneration. In stage I single setae are present, but modified and partly

united as in Phobetron, and showing an alternation of strong and weak segments. We have atrophy of the warts without the loss of the primitive first stage.

I class this type higher than type 4 because the warts have entirely disappeared and the structure is so modified that there is no evidence in the individual ontogeny of the derivation from wart-bearing ancestors; but it is difficult to compare the types exactly, as they are so diverse and have pursued such different lines of development. To this last type belong both the European species.

It might have been antecedently expected that the Australian type would prove to be an ancient one from consideration of the many other generalized animals found in that country, yet such is not the case. In fact the Australian Eucleids are distinctly specialized, belonging to the highest phylum of the horned larvae (type 3) and forming a peculiar branch of that phylum, as the following characters show:—

The horns (hypertrophied warts) are present in two rows, subdorsal on joints 3 to 13, lateral on joints 3, 4, 6 to 12; the spiracle on joint 5 moved up into the place of the missing horn; skin with irregular clear granules; caltrops present in little elliptical sunken patches at the bases of the lateral horns of joints 6 to 12 and subdorsal of 13. So far the larva stands just on a level with *Euclea indeterminata* and *Adoneta spinuloides* which have no detachable spines, lower than *Euclea delphinii* and *Sibine stimulea* which have them and again higher

than *Sisyrosea textula* and *S. nasoni** which do not possess caltrops.

The shape is elongated, spaces equal except the narrowed subventral space; feet as usual, the suckers showing distinctly on joints 5 to 11, apparently absent on 12 and 13. Thoracic feet small, distinct. The horns are unequal in length as in *Euclea*, but the inequality is a special one. There are besides two simultaneous modifications of the original stinging spines. These are, first, the formation of the retractile horns and, second, the conversion of the other horns into long smooth tentacles.

The first of these is indicated in some of our own species, as in *Sisyrosea nasoni*, where all the subdorsal horns of joints 4 to 12 can be depressed outward with convergence of all the spines to a point, or, more exactly in *Parasa chloris* where the subdorsal horns of joints 4, 5, 11 and 12 are bent in over the back with the spines not erected. In fact this rudimentary condition of *Parasa* represents exactly the beginnings of the structure of the Australian Eucleids. Not only is the structure similar, but it is the horns of the same segments that are thus affected. In *Doratifera vulnerans* Lewin the retractile horns are on joints 4, 5, 11, 12, while in *D. lewini* Scott and *D. casta* Scott they are on joints 4 and 5 only. The retractile horns consist of a short fleshy shaft with numerous spines which

* The larvae which I call *nasoni* have not yet been bred, hence the determination is not certain.

bend inward over the back, the spines becoming converged and the whole concealed by a triangular fold of skin. The presence of this fold is the only essential difference between these tufts of *Doratifera* and our *Parasa*. The muscular function may be slightly present in *Parasa*; it is certainly so in *Sisyrosea nasoni*, though in this case the horns bend outward.

The second modification is produced by the lengthening of the horn and the reduction of the stinging spines. I find on the tentacles of the larva sent me by Mr. Olive not only a few setae, but several distinctly formed, though very short stinging spines, as well as a great number of degenerate irregular lumps, representing the mass of the spines. In

this larva the tentacles are present for all the horns of the lateral row and joint 13 as well as for the subdorsals of 3 and 12 where they are especially long.

The subdorsals of 6 to 11 are very short, rudimentary, again much as in our *Parasa*, but their spines are absent, just as on the long horns, which is not the case in our species.

To summarize: the Australian Eucleids belong to the group of the horned Eucleids of Asia, Africa(?)* and America, but differ in having the spines removed from the horns which have not become eversible. It is a distinct and peculiar specialization of one of the highest types of larvae and possibly represents the most modified Eucleid larva on the earth.

PACIFIC COAST COLLECTING.—II.

BY ALBERT PITTS MORSE, WELLESLEY, MASS.

LOCALITIES.

Yuma. R. R. hotel; drinking-water detestable. Surroundings chiefly river-flats covered with willow-thickets, and desert. A rocky hill, chaparral, and ranches at a little distance. This place and points in Colorado Desert are likely to be extremely hot.

Indio. R. R. hotel. Desert thickly covered with weeds and chaparral; fruit ranch with artesian well and running water. Mesa and foot of mountains 3 to 4 miles distant. A good place.

Palm Springs. Five miles from station of same name and directly at base of San Jacinto Peak. Inn and fruit ranches. Desert, ranches with fields and orchards, several canyons with wild date-palms, streams, waterfalls, etc. An extremely favorable locality.

Additional places in the Colorado Desert that would probably repay visits are Flowing Well—natural spring, — Salton — 250 ft. below sea-

* I have seen no African larvae, but species of *Parasa* are recorded from there.

level, salt wells, — and Walters—much like Indio.

Cabazon. Opposite this station a disused logging-road runs up several thousand feet on San Jacinto Peak.

Beaumont. Banning. Near summit of pass. Wheat-ranches and fruit-orchards; hills and mountains in background.

San Bernardino. Good central point, with great variety of collecting grounds within easy reach. Fields, orchards, streams, arroyos, etc.; river and meadows at Colton. A very satisfactory trip is by Santa Fe R. R. to Cahon or Summit station in Cahon Pass (camp out) for mountains, canyons, etc. Mt. San Bernardino (11,600 ft.) can be reached from this vicinity; San Jacinto Peak (11,000) from San Jacinto; burro trails.

North Ontario. Trails to Cucamonga Peak (8,000), and Old Baldy (10,000).

Los Angeles. Fine central point. Good collecting along river and hills near trolley-line to Pasadena. Be sure to visit Mt. Wilson, — R. R. and carriage to Eaton Canyon, burro-trail to summit, where good accommodations are to be had; good collecting at deserted ranch opposite water-trough 3 miles up, and at summit. Try sea-shore at South Santa Monica (sand, saltmarshes, etc.) or at Long Beach. Visit Santa Catalina Island.

San Diego. Temperature delightful. Fauna similar to that of region about Los Angeles. Be sure to visit Pt. Loma and Coronado, — chaparral,

sand, saltmarshes, botanic gardens; meadows, marshes, and hills at Oldtown; sand and saltmarshes toward National City.

Lancaster. In tree yucca belt on south side of Mojave Desert. Desert, ranches, artesian wells and tanks, running water; good variety and rich collecting-ground; stay at least two or three days.

Mojave. Not to be thought of; nothing but bare sand on one side and a forest of creosote-bush (*Larrea*) on the other.

Tehachapi. At summit of pass, 4000 ft. Wheat-ranches, pasture foothills, pine forest on mountains. Go up road to mines and forest west of village. Salt lake 6 miles south. A good place.

Caliente. At base of mountains, 1300 ft. Looked interesting and would probably repay a visit.

Bakersfield (Kern City). Irrigated ranches and desert-like wild land; collecting fair.

Tulare. Good place, — ranches, wild land, streams, gardens, etc.

Raymond. Point of departure for Yosemite Valley. At base of hill-country; oak-dotted hills and a few streams.

Route to Yosemite Valley. Country more hilly but much the same as that about Raymond till near Ahwanee, where there is good collecting at Crook's ranch, — streams, fields, orchards, etc. A few miles beyond the forest begins and continues till the Valley is reached, with openings at Fish Camp and Wawona, — streams, mead-

ows, etc., collecting good but much like that in the Valley. The Big Tree Grove is 2 to 3 miles (by trail) off the road between Fish Camp and Wawona.

Yosemite Valley. Forests, streams, meadows, a few fields and orchards. Trail to Cloud's Rest gives good range of elevation and collecting up to nearly 10,000 ft. A few high meadows on road from Glacier Pt. to Chinquapin, if one returns that way.

San Francisco. Central point. Among other places visit Mill Valley and Mt. Tamalpais,—redwoods in canyon, streams, fields, hills, etc. Salt-marshes and hills at Baden; marshes and sand at West Berkeley. Leona Heights is well recommended.

Sacramento. A good place, on river. Extensive marshes along R. R. west of city; woods, fields, etc., east of city.

Tehama. On Sacramento River. Good variety, fields, orchards, woods, river-banks and washes.

Sisson. 3500 ft. An excellent collecting-ground; forest, ponds, streams, springs, meadows, fields; State fish-hatchery. Be sure to visit base of Mt. Shasta (10 miles, horseback or foot, camp out) and collect about timberline, 7500 to 9000 ft., nothing of interest above. The ascent of Shasta (14,400 ft.) may be accomplished on foot in one day from camp and back (7000 ft. climb) or the night may be passed on the summit in lee of shelter-corrals and food cooked at hot springs. Snow-fields, glaciers, volcanic rocks and debris, and at summit hot springs, steam, and sulphurous gases and a very

extensive view. It is a stiff climb, not very difficult or dangerous, but should not be attempted alone; secure guide—E. D. Stewart—and horse at Sisson.

Gazelle. 2700 ft. In Shasta Valley. A rich collecting-ground with good variety of surroundings and an interesting contrast in fauna to that previously met.

Klamath. At lower end of Shasta Valley; sage-brush, stony hills, streams, etc.

Hornbrook. On branch of Klamath R. Looked interesting, with farms, pastures and orchards, woods in background.

Siskiyou, Or. 4130 ft. In forest at north end of tunnel through Siskiyou Mts. Forest, ledges, small stream. Good.

Ashland. 1900 ft. Farms, orchards, hills, streams, mountains and forest in background. A very good place.

Grant's Pass. Much the same as Ashland, also very good.

Glendale. On Cow Creek, in dense forest. A beautiful spot and well worth a stop.

Roseburg. On Umpqua River. Stage to coast. Open plain and hill country; soil adobe; collecting fair.

Drain. A good place, with much variety; sandy soil, streams, hills, farms, forest, etc.; collecting excellent.

Willamette Valley. The Willamette Valley is quite uniform in character, and there is little choice of collecting-points. Chemawa, Woodburn, and Clackamas looked promising. Corval-

lis (on R. R. from Albany to coast) is good. Mary's Peak (4000 to 5000 ft.) in Coast Range, will repay a visit; take R. R. from Albany to Philomath, road 3 miles, trail 5 miles. Trail runs up through untouched forest; on summit is a large grassy pasture and a fine view of the Cascade Mts., including nine snowclad peaks.

Portland. Go up on the Heights and reconnoitre. Take trolley-car to Columbia slough for flower-loving insects. Do not miss trip by steamer up Columbia River to Hood River or Dalles east of Cascades, — an all-day ride. From Hood River one may go by stage to Cloud Cap Inn at timberline on Mt. Hood.

Western Washington is much like the Willamette Valley, but more thickly wooded. For forests try Ainslie or Napavine; for open mixed country Chehalis or Centralia. Tenino is very good, — stream, forest, clearings, prairie pastures, etc. Treeless gravel plains at Yelm Prairie. Fine old forests in vicinity of Wilkeson and Carbonado,

— by R. R. from Tacoma. Tacoma presents a good variety on the outskirts of the city, — salt-marshes, fields, forests, lakes and gravel plains 6 to 10 miles southwest.

These are a few of the more desirable localities and chiefly those with which I became personally acquainted. There are, of course, many intermediate points that will repay examination if a relatively small area is covered or a particular section is to be investigated. The coastwise country may be reached by steamers from San Francisco or Portland and thence from port to port as opportunity offers, or in some cases by railroad or stage. If preferred, one may, at a slight increase of expense, secure a ticket over the Coast division of the So. Pacific R. R. between Los Angeles and San Francisco, thus reaching Santa Barbara, the Salinas Valley, and other portions of this region. A trip to the Yosemite Valley may be made from San Francisco (by steamer to Stockton, etc.) for less than from Berenda, the usual approach.

BUTTERFLY LIFE IN THE TROPICS OF INDIA.

[In a recent paper by Messrs. Davidson, Bell and Aitken on the butterflies of the North Canara district of the Bombay Presidency, in which particular attention is paid to the early stages, we find the following passage, which presents in a few words a striking contrast to what is found in temperate regions and which may therefore interest our readers.]

Collectors in other parts of India often write of the number of broods in the year in terms which imply more regularity than we have observed in this moist and equable climate. We are not inclined to think that the majority of species here have any fixed number of broods in the year. One generation succeeds another as fast as conditions permit. It would be difficult to name

any month in the year when many common species, such as *Euploea core*, may not be seen laying their eggs.

They are undoubtedly much more plentiful in some months than others, but this is because the largest number of larvae come to maturity at those times when succulent young leaves are most plentiful and enemies least active. Many species, however, pass through a certain portion of the year, which is unfavorable to them, in a state analogous to hibernation. For example the smaller Lycaenidae, such as *Zizera*, are not to be seen from June to August, when the heavy rain would beat down such feeble butterflies and drown their larvae. They appear in September and swarm for some months after. The same is true of *Hypolimnna misippus*, perhaps because it feeds on ground weeds, and the larva is liable to be drowned by heavy rain. On the other hand, *H. bolina* and the majority of the Nymphalinae and also the Papilioninae are much more abundant during the monsoon than at any other season. By the end of the year some of them have become very scarce, if they have not disappeared altogether, and it is evident that those which feed on deciduous plants cannot be in the larva state from December to March and later. The Pierinae, excepting *Nepheronia*, are less abundant during the rains than in the cold season, and *Atella phalantha* may be called a dry-season butterfly; its period of inactivity is the monsoon.

How each species tides over the par-

ticular time which is unfavorable to it is an interesting question on which our knowledge is very limited. We have proved that *Papilio nomius* regularly remains in the pupa state from August till the following March or May; but this is a peculiar case. In *P. clytia* the pupa state is often prolonged for weeks or months without regard to season. But in the vast majority of species the pupae in our cages hatch on the due date as regularly as hen's eggs. Yet there are good reasons for thinking that it is in the pupa state that most butterflies pass through the time when nature is against them. It is also not improbable that eggs laid at an unfavorable time remain unhatched till next season. Lastly, some Hesperiiidae hibernate in the larva state. The larva when full grown stops eating and shuts itself up in a cell as if it were about to become a pupa, but it does not actually undergo that change for some weeks or even months. We are not disposed to believe that in this climate the imago hibernates as it commonly does in Europe.

Apart from hibernation, the length of a larva's life varies a good deal according to the supply of food. When tender leaves are plentiful they grow fast. Butterflies of strong build and powerful flight, such as the *Charaxes* and the larger Hesperiiidae, live much longer in the larva state than others. The duration of the pupa state, on the other hand, seems to depend on little else than size. Small Lycaenidae emerge in a week, the majority of medium-sized

butterflies in ten days, and the Papilios in a fortnight. Troides (Ornithoptera) takes three weeks. (Journ. Bomb. nat. hist. soc., X, 1-3).

THE ACRIDIAN SUBFAMILY MASTACINAE IN THE UNITED STATES.

THE American Mastacinae hitherto known are the genera Mastax and Masyntes, which have been reported only from South America and the West Indies.

In his collections on the Pacific coast last summer Mr. A. P. Morse obtained two specimens of an apterous and possibly immature Mastacid, one at Cahon Pass in southern California on July 19, the other on Mt. Wilson, Altadena, near Los Angeles, on July 27. They belong to a new generic type, most nearly allied to Masyntes Karsch but differing from it by having a more appressed head with less convex vertex, the fastigium prominent as in Masyntes but broadly convex instead of sulcate or laterally marginate, apically broadly rounded and not emarginate, the lateral carinae of the metazona much less pronounced, the posterior angle of the lateral lobes rectangulate and the spines of the hind tibiae of uniform length. The body is cinereous with a broad black median stripe on the vertex, and on the upper half of the lateral lobes of the pronotum, continued on the abdomen; the fore and middle legs are ruddy. The length of the body and of the hind femora is only 9 mm. The genus may be called *Morsea* and the species *californica*.

Samuel H. Scudder.

EARLY STAGES OF TROPICAL BUTTERFLIES.

In another place in this number we have printed an extract from a paper by Messrs. Davidson, Bell and Aitken, on Bombay butterflies. This paper which appears in vol-

umes x and xi of the Bombay journal is one of the most important contributions to our knowledge of the early stages of tropical butterflies that have appeared in recent years. It is accompanied by eight colored plates of caterpillars and chrysalids and is in continuation of a paper by two of the number in the same journal eight years ago, where six similar colored plates are given and notes of no less than 94 species which they had themselves reared. The present paper includes a list of the butterflies of the district, which they enumerate as 233 species and of these notes are given or referred to of the earlier stages of all but 36. This is a remarkable showing.

PROCEEDINGS OF THE CLUB.

14 January, 1898. The 198th regular and 21st annual meeting of the Club was held at 156 Brattle St., Mr. A. P. Morse in the chair.

Reports from the several officers were received and the following persons elected for the ensuing year:—President, T. E. Bean; secretary, Roland Hayward; treasurer, Samuel Henshaw; librarian, Samuel H. Scudder; members at large of the executive committee, J. W. Folsom and S. H. Scudder.

The address of the retiring president, Dr. H. G. Dyar, on the larvae of the Australian Eucleidae, was read by proxy. It is given elsewhere in this number.

Mr. R. Hayward showed a female specimen of *Zarhiptis integrivenis* sent him recently by Mr. L. E. Ricksecker of Santa Rosa, Cal. Mr. Ricksecker stated in a letter that he had obtained three females, from which he procured eggs. A few larvae were obtained, but they died soon after hatching.

The females were luminous in every segment when alive, and very beautiful.

This led to some discussion of the females and larvae of the Phengodini.

Mr. S. H. Scudder brought to the notice of the club two recent instances of commercial introduction of exotic Orthoptera. The first was a very large Mantis taken alive Oct. 16 at Mt. Airy, Philadelphia, and of which two photographs, sent by Mr. C. Few Seiss, were shown. The specimen is a *Tenodera* about a decimeter long; so far as the photographs show, it does not appear to agree perfectly with the descriptions of any of the species known, which occur only in the tropics of the old world from India to New Zealand and Japan and also in Africa. Eggs were found in the body and it is difficult to understand how so large an insect could be imported alive to the Atlantic coast of temperate America without detection en route. The other instance was *Diestrammena marmorata* (De Haan), a Japanese insect allied to our *Ceuthophilus*; specimens were exhibited which had been found in some numbers in greenhouses in Minnesota by Prof. Otto Lugger; the direct means of its introduction had not been ascertained.

Mr. Scudder referred to a previous exhibition of specimens of the destructive locust of Argentina, *Schistocerca paranensis* (Burm.), which he had received from Prof. L. Bruner and showed further specimens exhibiting the species at the time of egg-laying, which differed by its less intense color from the winter roseate form previously shown.

He also reported that he had recently heard from Dr. A. G. Mayer, now at the Fiji Islands, that *Anosia plexippus* is one of the commonest butterflies in Suva and that it is also common at Ovalau, Tamloe and Vanna Mbalavu, all of which were inhabited by a considerable number of whites; on the other hand he states that it certainly does not exist upon most of the other Fiji Islands and is apparently confined to those where commerce can readily have brought it.

Mr. Scudder also announced the capture at Bristol, Me., by Miss Katherine W. Huston in July last of a specimen of *Basilarchia proserpina*. *B. arthemis* is said to be quite abundant in that locality, while *B. astyanax* has never been observed.

Mr. A. P. Morse spoke briefly upon the relative abundance of different groups of Orthoptera on the Pacific coast, as noted by him during a recent collecting trip. In point of number of species and wide-spread distribution Oedipodinae were most numerous, with Acridinae, especially *Melanoplus*, a close second; Tryxalinae and Tettiginae were much less plentiful, occurring locally and in relatively small numbers. Of Locustarians Xiphidium was the only genus represented abundantly, though *Scudderia*, *Stenopelmatus* and certain *Decticus* were not uncommon locally. Of Gryllidae, *Gryllus* and *Oecanthus* were most common, occasionally plentiful and sometimes *Tri-dactylus* was common. Blattidae, except introduced species were scarce. No Phasmatidae were seen.

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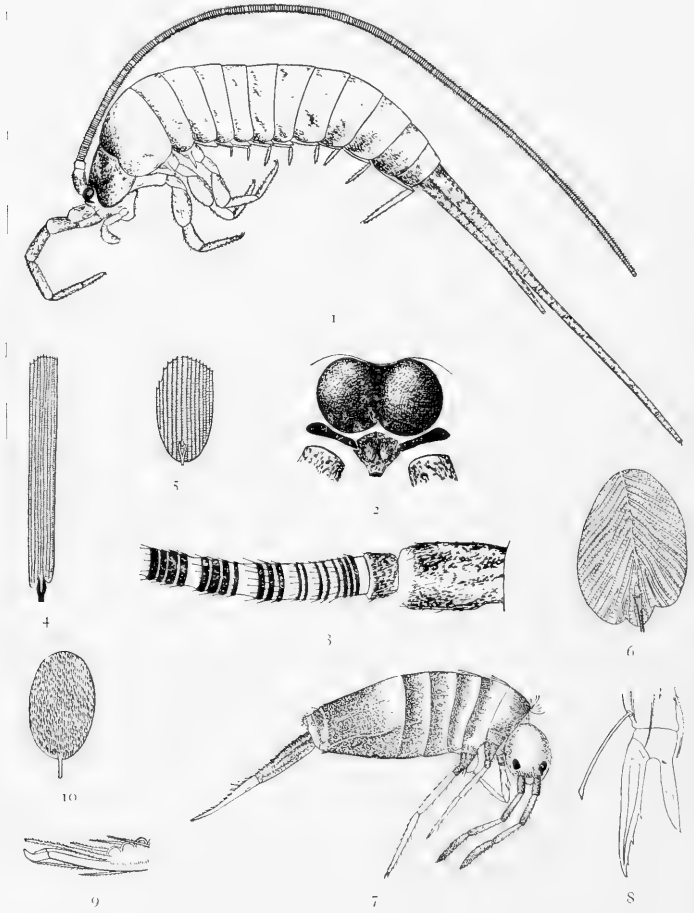
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MEXICAN SPECIES OF MACHILIS AND SEIRA.

EXPLANATION OF PLATE 4.

Fig. 1. *Machilis conjuncta*, n. sp. $\times 5$. For convenience, only the basal segment of the left antenna is shown and the left maxillary palpus is turned down.

Fig. 2. *Machilis conjuncta*. Anterior aspect of the eyes, $\times 25$.

Fig. 3. *Machilis conjuncta*. Basal portion of antenna, $\times 25$.

Figs. 4, 5. *Machilis conjuncta*. Two of the various forms of scale, $\times 252$.

Fig. 6. *Machilis conjuncta*. A common but anomalous scale, $\times 567$.

Fig. 7. *Seira mexicana*, n. sp. $\times 25$.

Fig. 8. *Seira mexicana*. Lateral aspect of right hind-foot, $\times 567$.

Fig. 9. *Seira mexicana*. Lateral aspect of right mucro and part of dens, $\times 567$.

Fig. 10. *Seira mexicana*. A scale from the dorsal side of the abdomen, $\times 567$.

PSYCHE.

DESCRIPTIONS OF SPECIES OF *MACHILIS* AND *SEIRA* FROM MEXICO.

BY JUSTUS WATSON FOLSOM, CAMBRIDGE, MASS.

I wish to describe *Machilis conjuncta* and *Seira mexicana*, two new species of Thysanura which were collected for me in Mexico, during the summer of 1897, by my friend, Mr. O. W. Barrett, of Clarendon, Vt.

Machilis conjuncta was taken in September at Cuernavaca, Morelos, on the Pacific slope, at an elevation of 5000 ft. and Mr. Barrett believes he has also seen the same species in lower Vera Cruz. The species is unfortunately described from a single specimen but can probably be identified without difficulty. The scales from the same individual are exceedingly variable in form, size, number of longitudinal ribs, etc., and consequently appear to have very little specific value in this case, at least; the forms which I have figured (Figs. 4, 5 and 6) are, perhaps, as common as any. The scale shown in Fig. 6 deserves special mention on account of the obliquity and bifurcation of its principal ribs; in these respects it departs widely from the type of scale which prevails in the genus *Machilis*.

Seira mexicana occurred in abundance near the city of Mexico, at 7300

ft. elevation; the species was found July 9 and 13, upon grasses, and numerous examples were also taken upon old cocoons on *Salix Humboldtiana*.

S. mexicana is nearest related to *Drepanura californica* Schött.* In conformity with the wish of this author, however, the genus *Drepanura* had better be merged into *Sira* Lubbock. "I therefore think that the greatest order is attained when (1) to the gen. *Lepidocyrtus* Bourl., all the forms are referred which have the mesonotum more or less projecting and the body clothed with scales, (2) to the gen. *Entomobrya* Rond., forms with the mesonotum not projecting and without scales, and finally (3) to the gen. *Sira* Lbk. forms clothed with scales but with the mesonotum not projecting. In consequence of this, the two temporary genera *Drepanura* and *Pseudosira*, before proposed by me, are to be excluded from the system." †

S. mexicana differs from *S. californica* in the plan of coloration and by

* Schött, Beiträge zur Kenntniss Kalifornischer Collembola. Bihang K. Sven. Vet. Akad. Handlingar. Bd. 17, Afd. iv, 1891. (See pp. 19—21 and Taf. iv, Figs. 2, 3 and 5)

† Schött, H. North American Apterygogenea. Proc. Cal. Acad. Sc., Ser. 2, Vol. vi. 1896. (See pp. 171—172)

having antennae, legs, claws and furcula which are relatively much longer; in addition, the superior claws are tridentate, the mucrones are not nearly as falcate as in *S. californica*, while the general pilosity is much less and the clavate dorsal hairs fewer and differently disposed. Schött makes no mention of barbellate hairs in the description of *S. californica*.

Machilis conjuncta, n. sp. General color blackish brown; the rubbed, alcoholic specimen which I have drawn (Fig. 1) is white with dark brown mottlings. The head, legs and subabdominal appendages are almost white. Head small. Eyes black, nearly spherical and united more broadly than usual (Fig. 2), in allusion to which the species is named. Antennae at least twice as long as the body and conspicuously annulated with brown; basal segment (Fig. 3) stout, cylindrical, two-thirds as broad as it is long; second segment subcylindrical but broader than long. Maxillary palpi slender with segments that are nearly cylindrical, simple, and in length as 1:2:3:3½:4:3:2½. Labial palpi with segments as 1:2:3; basal segment globose; second, cylindrical; third, stout, and crescentic in lateral aspect. Body rather cylindrical, but slightly tapering; the relative lengths of its segments, as measured along the median dorsal line, are about as 3:6:3:3:2:2:2½:3:3:3:3:2:1½. Prothorax with a prominent antero-lateral lobe; mesothorax with an antero-lateral emargination. Legs stout; trochanters obliquely separated from the femora; femora much swollen; the coxal appendages of the mid- and hind-legs are slender and conical. The subabdominal, paired appendages, occurring, as usual, only upon abdominal segments two to nine, inclusive, are conspicuous and slender. Median cercus at least longer than the body and annulated; lateral cerci much smaller, about half as long as the median cercus and simi-

larly annulated. Scales (Figs. 4-6) extremely variable, as already remarked.

Length 13 mm., exclusive of appendages. Described from a single type, which has been deposited in Museum of Comparative Zoölogy at Cambridge, Mass.

Seira mexicana n. sp. Usual color blackish purple, with a conspicuous yellowish-white band on the anterior part of the fourth abdominal segment, occasionally obliterated; often every segment is banded, as in the specimen which I have represented (Fig. 7) and will describe with some detail. Head with an irregular, white, dorsal patch surrounded with purple. Eyes present, normal. Antennae slender, over twice as long as the head; antennal segments cylindrical, purple with pale bases, and in length as 2:3:3:4. Body rather cylindrical, sparsely hairy, with three dorsal clusters of clavate hairs. Mesonotum not projecting. Legs slender, the hind pair longest; coxae and trochanters purple, the remaining segments yellowish-white; tibiae furnished with barbellate hairs and also a single tenent hair; superior claw (Fig. 8) straight, slender, tapering and tridentate; inferior claw about half as long, broadly linear, acute and simple. Furcula attaining the ventral tube; manubrium purple, sparsely hairy; dentes white, subequal to manubrium, slender, strongly crenulate (Fig. 9), with stiff, barbellate bristles, except at the apex of each dens, which is slender and bare; mucrones consisting of a simple, slightly falcate segment. Scales varying from elliptical-oval (Fig. 10) to narrow-elliptical, thickly covered with minute, lanceolate markings and having a long, linear pedicel. Fig. 10 represents a scale from the dorsal part of the abdomen; on the ventral side of the abdomen the scales are three times as long and narrowly-elliptical.

Length, 2 mm. Described from fifty-two types, some of which have been given to the Museum of Comparative Zoölogy, at Cambridge, Mass. Mr. Barrett informs me that he has retained duplicates of this species for Museo Nacional, of Mexico City.

ATHYSANELLA, A NEW GENUS OF JASSIDS.

BY CARL F. BAKER, ALA. POLYTECHNIC INST., AUBURN, ALA.

Athysanella gen. nov.

* *Athysanus*-like forms, small, pale fulvous, or grayish; and rather robust. Head wider than pronotum, vertex rather strongly, but very obtusely angulate, the usually convex and more or less transversely depressed vertex broadly rounded on to the front; at apex usually with two large and one small, black spots. Rostrum weak, shorter than clypeus. Clypeus broad, the sides very gradually converging to the rounded apex. Ocelli on extreme front edge of vertex and close to eyes. Front short and broad, conspicuously wider than clypeus at clypeal suture, the sides sinuate and slightly diverging upward. Lorae about one half width of clypeus or less, and of about the same length. Antennae about as long as head and pronotum together. Pronotum transverse, about as long or shorter than vertex, feebly transversely wrinkled posteriorly and with a few faint punctures.

Usually brachypterous. In macropterous individuals the elytra about equal the abdomen in length, with a broad appendix extending around the apex; with four apical cells including the one between the first anteapical and costa, which should perhaps not be called an apical; with two anteapical cells, the second a part of the basal cell cut off by the usual transverse vein which enters radial cell; the radial, first anteapical, and first true apical directly in line; the first true apical narrow, sides subparallel, the second and third true apicals broad, broadening apically. Wing with the short costal or supernumerary cell distinctly defined; with two apical cells, the second about half the width of first, the submarginal about half the

width of marginal. The ovipositor always long and strongly exerted. Type *Athysanella magdalena* n. sp.

This is a small group of closely related western forms, which will include together with several undescribed, *Athysanus curtispennis* G. & B., and *Eutettix terebrans* G. & B. Of some of the species here placed in this genus, the fully winged forms are unknown, but other characters make their relationships very evident.

The head in this genus is much like that of *Athysanus* in many respects, though more produced than is usual in that genus. The characteristic elytral and wing venation throw it at once into a group which includes *Aconura*, *Gnathodus* and *Henschia*. But it is very distinct from any of these. It should not be confused with that group of *Deltocephalus* which includes *argenteolus* and its allies. These are also dimorphic and possess the elongate ovipositor. It has only a superficial resemblance to *Doratura*, the head in that genus being totally different.

Athysanella magdalena n. sp. Macropterous female. Length 3.25 mm. Front little more than one-fifth longer than broad, about twice the length of the clypeus. Clypeus about one-fifth longer than broad. Vertex very obtusely angulate, broadly transversely depressed at middle, length on median

line four fifths of width between the eyes. Pronotal breadth somewhat more than twice and a third the length, the latter slightly greater than that of the vertex. Elytra scarcely equalling the tip of the ovipositor.

Color pale sordid fulvous. Front with about seven dark transverse curved arcs on either side, sutures of front, clypeus, and lorae black. Front edge of vertex with a large more or less distinct black spot on either side of apex, and a small one at its extremity. Disc of vertex with a median transverse brown cloud on either side, and an acute black point springing from the hind margin on either side. Pronotum cinereous, lighter on anterior margin where there occur more or less distinct spots as follows: two approximate near median line, two behind each eye, and usually one elongate near the lateral margin. Scutell pale fulvous, basal angles and an irregular area on median portion darker. Elytra opaque, nervures whitish. Dorsum as in brachypterous female, of which see description below. Venter except portions of last segment blackish, pygofers each with a median longitudinal brown stripe. Abdomen sometimes suffused with a deeper black. Anterior and middle femora with a more or less distinct dark annulus near the knee.

Brachypterous female. Elytra not half length of abdomen, hind margin very broadly rounded, nearly truncate. Dorsum with three pairs of fine dark longitudinal lines, one median and two lateral, between these two or three black dots on each segment.

Last ventral segment of female twice the length of preceding, the hind margin deeply broadly emarginate, the emargination nearly filled by a large obtusely rounded tooth, which is narrowly black margined and about equals the lateral angles. Ovipositor about three fourths the length of the abdomen, exceeding pygofers by one third of its length.

Male. Length 3 mm. My specimens are all macropterous. In many the black spots on apex of vertex are reduced in size and light

brown. The abdomen excepting the plates is darker than is usual in the female, and more or less distinctly variegated with black and yellowish. The valve is about as long as the preceding segment and obtusely angulate, its disc black. The plates are three times the length of the valve, outer edges straight, inner edges gently curved outward to meet the outer edges in a rather acute point; each plate with a black spot at base.

Described from one female from the Magdalena Mountains, New Mexico, Aug. '94 (Snow), and numerous specimens from Colorado collected by myself at the following points:—Fort Collins, Aug. 20th to Sept. 19th on *Bouteloua oligostachya*; Foothills west of Fort Collins, April 25th to May 6th; at Forrester's Ranch on the Upper Laramie River (elev. about 8000 ft.) August 3d. This is apparently a common species in the West. One female from Colorado is much more strongly fulvous throughout and has the markings somewhat obscured.

Athysanella occidentalis n. sp. Brachypterous female. Length 3mm. Closely resembling *magdalena*. Front about as long as broad, once and a half the length of the clypeus. Clypeus one fifth longer than broad. Vertex obtusely angulate, slightly depressed posteriorly, length at middle nearly equalling the width between eyes. Pronotal width twice and three fourths the length, the latter little more than four fifths that of the vertex.

Color sordid fulvous, darker beneath. Head marked as in *magdalena*. Pronotum somewhat cinereous, in front medially with four black spots in a transverse row, and laterally two behind each eye. Dorsal segments each with a median transverse row of

about eight black dots, medially and laterally with indistinct pairs of longitudinal lines; base of terminal segment black. Venter except edges of pygofer, very dark. Fore and middle femora obscurely annulate with brown.

Last ventral segment a little longer than preceding, hind margin slightly roundly produced at center, laterally sloping. Ovipositor extending one fifth of its length beyond the pygofer. Pygofer with a few white hairs at extremity.

In macropterous females the elytra do not differ from those of *magdalena*, except that toward the apex the white veins are distinctly narrowly bordered with brown.

Described from ten females collected by myself at Fort Collins, Colo., and in the adjoining foothills, from April 23d to July 18.

Athysanella acuticauda n. sp. Brachypterous female. Length 3.5 mm. Resembles *occidentalis* in coloration, but is stouter. Front about as broad as long, once and three fifths the length of the clypeus. Clypeus one fourth longer than broad. Vertex very obtusely angulate, slightly depressed posteriorly, length at middle three fourths of width between the eyes. Pronotal width twice and three fourths the length, the latter four fifths that of the vertex.

Color as in *occidentalis*, except that on the pronotum there are but two median spots. Venter darkened at base, a broad median portion of last ventral segment and a longitudinal line on each pygofer, black.

Last ventral segment a half longer than preceding, hind margin truncate or slightly sinuate, the lateral angles slightly roundly projecting; the ovipositor extending one sixth of its length beyond the pygofer.

Macropterous female. Elytra deep fuliginous, the veins yellowish, sharply contrasted.

Brachypterous male. Valve as in *magda-*

lena, plates very short, subtriangular, bent outward and widely diverging.

Described from nine females and one male. The single male was collected at Algonquin, Ill., Aug. 1st. (Dr. W. A. Nason). The females are distributed as follows: Algonquin, Ill., July 20th (Nason); Toronto, Canada, (R. J. Crew and C. T. Hills); and at the following localities in Northern Colorado, collected by myself: Foothills near Fort Collins, June 20th to Aug. 4th and at various points in the mountains up to 11800 feet altitude at Cameron Pass.

Athysanella robusta n. sp. Brachypterous female. Length 4 mm. Form nearly of *acuticauda*. Front very little longer than broad, once and four fifths the length of the clypeus. Clypeus one sixth longer than broad. Vertex broadly tumidly rounded in front, slightly depressed posteriorly, length at middle two thirds of the width between the eyes. Pronotal width twice and four fifths the length, the latter little less than that of the vertex.

Color pale fulvous; markings as in *acuticauda*, except that the vertex has only a small comma shaped brown dot on either side half way between eye and apex, the large black spots being absent. Elytra cinereous, with five brown dots along apical border.

Last ventral segment of the same length as preceding, broadly emarginate with a large rounded shining black tooth nearly filling the emargination and equalling the lateral angles. Ovipositor exceeding the pygofer by little less than one fifth of its length.

Brachypterous male. Valve black, narrowly edged with yellowish, plates short,

about as long as wide, inner margin straight, outer margin at the apical two thirds incurved to the obliquely truncate apex, which is very slightly emarginate.

This is also a Northern Colorado inhabitant. The three males before me were collected in the foothills west of Fort Collins, Aug. 4th. One of them is slightly larger than the others and distinctly suffused with reddish, but it has the peculiar plates of the others. The females are also from the lower foothills, taken May 6th to July 21st.

Athysanella attenuata n. sp. Brachypterous female. Length 5 mm. This species resembles *terebrans* and *curtipennis* and is the largest most robust representative of the genus. Front a twelfth longer than broad, about twice the length of the clypeus. Clypeus one fourth longer than broad. Vertex very obtusely angulate, transversely depressed posteriorly, length at middle five-sevenths of width between eyes. Pronotal width twice and a third the length, the latter equalling that of the vertex.

Color very pale fulvous, brighter below, tip of ovipositor reddish. Vertex and face with the markings usual to this genus. Pronotal dots subobsolete. Elytra cinereous. Dorsum with indications of lateral lines, and with a double median longitudinal row of black dots; last segment black at base.

Last ventral segment twice the length of preceding, medially broadly black, the hind margin truncate or very slightly trisinate. Ovipositor exceeding the pygofers by little less than one-third of its length.

Brachypterous male. Length 3.25 mm. Darker throughout than the female. Valve longer than the preceding segment, triangular, the apical portion somewhat narrowed. Plates triangular, twice the length of the valve and rather strongly diverging.

Described from four males and many females collected by myself in Northern Colorado. It occurs at Fort Collins throughout the summer season and I have also taken it at Forrester's Ranch, on the Upper Laramie River on Aug. 3rd.

Athysanella incongrua n. sp. Brachypterous male. Length 3.25. Front one seventh longer than broad, a little less than twice the length of the clypeus. Clypeus one fourth longer than broad. Vertex very obtusely angulate, broadly depressed posteriorly, length at middle six sevenths of the width between the eyes. Pronotal width twice and a third the length, the latter less than that of the vertex.

Color very pale fulvous, head, pronotum, and abdomen with a distinct rosy tint, especially on the last. Arcs on front indistinct. Vertex, just before apex, with two small brown closely approximated dashes, one on either side of a white median line; a small black dot on either side of this, near the front margin. Pronotum anteriorly with two minute median dots, and three behind each eye. Dorsum with indications of median and lateral lines, each segment with a transverse row of about ten distinct black dots; the last segment blackish at base. Apical margins of ventral segments blackened.

Valve shorter than the preceding segment, broadly rounded, disc dark. Plates about twice length of valve, somewhat diverging, and gradually narrowed to a truncate tip.

Described from one specimen collected by myself in the foothills west of Fort Collins, Colo., July 21st. There is no female in my collection with which I can associate this. It somewhat resembles the ♂ of *attenuata*, but differs widely in color of head and in genital characters.

Athysanella minuta n. sp. Brachypterous female. Length 2.5 mm. The smallest and darkest species in the genus, though the head and pronotum are nearly as broad as in *magdalena*, which it somewhat resembles. Front about a tenth longer than wide, once and five sixths the length of the clypeus. Clypeus one-fourth longer than broad. Vertex very obtusely angulate, slightly transversely depressed posteriorly, length little more than five sevenths of width between eyes. Pronotal width twice and one half the length, the latter less than that of the vertex.

Color sordid fulvous. Head markings as in *magdalena*, but darker. Pronotum with four dots near middle, the two inner darker, and with three behind each eye. Abdomen quite obscured and dark throughout.

Last ventral segment slightly longer than the preceding, hind margin evenly truncate. Ovipositor exceeding pygofer by less than one sixth of its length.

Brachypterous male. Length 2 mm. Venter except lateral margins black. Valve large, convex, very broadly rounded, deep black with a fine yellow margin. Plates yellowish, extending less than the length of the valve beyond it. Beyond the valve the plates are equilaterally triangular, the inner margins diverging.

Described from one female and two males collected by myself at Fort Collins, Colo., June 7th to Aug. 6th and at Forrester's Ranch, on the Upper Laramie River, Colo., Aug. 3rd.

DESCRIPTION OF A NEW SPECIES OF ARCTIIDAE WITH A TABLE OF THE SPECIES OF IDALUS.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Idalus pichesensis n. sp.—Head white, a large deep yellow spot on the vertex and the upper half of the front black, palpi black above and at tip. Thorax white, collar broadly lined behind with crimson and the patagia less distinctly bordered with this color; a deep yellow patch in center of thorax with two black dots before and two behind; a yellow patch in the center of each patagium. Abdomen crimson above with a dorsal row of indistinct white spots. Below white, fore coxae inwardly, posterior orbits and a tuft below fore wing crimson; fore femora and tibiae shaded with gray, middle femora much less so, the middle and posterior tibiae with a black spot at tip. Fore wing thinly scaled outwardly, slightly iridescent, deep yellow, costa and fringe white; discal band black, straight, a little narrowed centrally, ending at costa and margin, cut with white by all

the veins and centered by the discal cross-vein, bordered with white on both sides except centrally. Basal patch similar, broadest at internal margin (the yellow median space thus much widest on costa), black, cut by white veins. Secondaries white. Below no markings except a few dusky scales on discal cross vein of fore wings. Expanse 44 mm.

1 ♂ Piches and Perene vols., Peru, 2000-3000 ft. (Soc. Geog. de Lima). U. S. Nat. Museum, type no. 3796.

Table of species of *Idalus*.

- | | |
|--|---|
| 1. Primaries with a dark spot outwardly between vein 5 and 6 | 2 |
| Primaries with terminal field immaculate | 7 |
| 2. Discal band which crosses wing broken only by the veins | 3 |

- Discal band divided centrally 5
 3. Discal band with two dark yellow spots within *crinis* Druce
 Discal band not so marked 4
 4. Thorax with 4 black dots centrally
 delicata Möschl.
 Thorax without black spots
 admirabilis Cram.
 5. Thorax with 4 black spots centrally
 dares Druce
 Thorax without black spots 6
 6. Fore wing white *ortus* Schaus
 Fore wing yellow *citrina* Druce
 7. Discal band separated from base by a median yellow space 8
 Basal half of fore wing brownish fawn color *lemba* Druce
 8. Discal band produced along the costa to apex 9
 Discal band not produced along costa; four black dots on thorax
 pichesensis Dyar
 9. Center of thorax deep yellow; no spots *critheis* Druce
 Thorax white, spotted with roseate brown *herois* Schaus

Of the other species listed by Kirby, *citriarius* Dogn. is probably congeneric with *Mazaeras ipsea* Druce (Zatrephes according to Kirby), which differs generically from *Idalus* in having vein 6 of secondaries present, on a very long stalk with vein 7; *dimas* Cr. looks like *Sciathos punctigera* Cr. (Megalopygidae), except for the coloration of the body, and the other species *rufoviridis* Walk., *enervis* Schaus, *lavinia* Druce, *larissa* Druce, *alba* Druce and *erythronotata* H.-S. also differ so much in pattern of marking from *Idalus* that I think they will be found to differ in structure as well, and I have not included them in the synopsis. The description of *lineosus* Walk. has not been examined.

I. citrina Druce, included above has been removed by Mr. Schaus to his new genus, *Pseudalus*, which differs in having the ♂

antennae pectinate. The venation seems to be the same and I have provisionally retained the species under *Idalus*.

TWO NEW SCALE-INSECTS QUARANTINED AT SAN FRANCISCO.

MR. ALEX. CRAW has just sent me another lot of Coccidae detected by him on plants which were about to be landed at San Francisco, and among them I find two very distinct new species, which are herewith described.

Diaspis crawii, n. sp. — ♀ scale nearly 3 mm. diam., circular, slightly convex, white; exuviae subcentral to sublateral, rather large, but inconspicuous, being of a very pale ochreous color. From one-quarter to one half of first skin overlapping second.

♀. After boiling in caustic soda colorless, the lobes remaining light brown. The form, after boiling, is unusually elongate. Median lobes rounded, radiately striate, only moderately large, their margin rather inclined to be irregularly crenate. Between the median lobes is a wide space, equal to about one-third of the breadth of a lobe. At the outer side of each median lobe are a bristle and a spine-like plate (gland-hair); then follows the second lobe, consisting of three large subequal lobules, the first lobule somewhat narrower than the other two; a spine-like plate between the second and third lobules; after the second lobe is a large spine-like plate; then comes the third lobe, consisting also of three large lobules, the first the smallest, the second the largest, a small spine-like plate between the second and third; after the third lobe comes a large spine-like plate; then after a short interval the fourth lobe, consisting of three very broad low lobules, the first low conical, the second only gently convex, and serrate with five teeth, the third almost flat, and similarly serrate; then follow a bristle and a large spine-like plate, and after them a couple of broad low processes repre-

senting the fifth lobe. The transversely elongate pores, marking the segments, are quite numerous and large. Five large groups of ventral glands, the intervals between them about as great as the diameter of one orifice. Caudolaterals of 21 to 31, cephalolaterals 49 to 58, median 29 to 30. Antennae represented by a curved bristle.

Hab.—On stem of some woody plant from China, just above the ground.

This species looks a little like *amygdali*, but it is larger and has much paler exuviae; the median lobes are smaller and further apart, and there are numerous differences of detail.

Aspidiotus (Odonaspis) bambusarum, n. sp.—♀ scale 2 mm. diam., very dark sepia brown, almost black, tolerably convex, dull; exuviae between the center and the side; first skin exposed, light orange; second large, brown, covered. A well-formed ventral scale.

♀. Hinder parts strongly chitinous, having a strong yellowish brown or umber color after boiling. No lobes. Pygidial area dotted all over with small glands as in *inusitatus*. Four long club-shaped processes as in *inusitatus*, but they are equidistant from one another. There is no median depression at the caudal extremity, but there is a depression or notch at the second club-shaped process, as in *inusitatus*. The deep lateral notches of the caudal portion, two on each side, are as in *inusitatus*, but considerably larger and deeper, with the anterior side more projecting. Anal orifice far from the end, as in *inusitatus*; it is only just posterior to the median group of ventral glands. Three groups of ventral glands; median of about fifty; laterals pyriform as in *secretus*, with a very large number of orifices, probably over 150. The sutures between the segments are curiously striated.

Hab.—On stalks of bamboo from Japan, with *A. secretus*. The scale is rather like *A. duplex*, and could be mistaken for it. *A. bambusarum* is a most interesting species,

closely allied to the anomalous *A. inusitatus* Green, from Ceylon, but in its ventral glands more resembling *A. secretus*. It appears that *Odonaspis* should be extended to include all three species, and probably it should take generic rank.

I will take this opportunity to state that Mr. Craw found fifty tea-bushes from Japan to be infested by *Diaspis amygdali* Tryon. They were destroyed. Tea is a new food-plant for *D. amygdali*.

T. D. A. Cockerell.

Messilla Park, N. M.

Feb. 12, 1898.

PROCEEDINGS OF THE CLUB.

11 February, 1898. The 199th meeting of the Club was held at 156 Brattle St., Mr. S. H. Scudder in the chair.

A letter was read by the secretary from Mr. T. E. Bean, the President-elect for 1898, declining the office. The declination was accepted and a new election ordered for the next meeting.

Mr. A. S. Hewins of Dedham was elected a member.

Recalling the exhibition at the last meeting of specimens of the Japanese *Diestrammena marmoratu* found in a greenhouse in Minnesota, Mr. S. H. Scudder read a portion of a letter since received from Prof. O. Lugger, in which he said they were found in the greenhouse at the University. "They came about three years ago and are still there, multiplying freely. They were first noticed in a shipment of plants from Florida, consisting mostly of the 'umbrella plant, which is I believe, a Japanese plant. . . . No Japanese plants were ever received directly at the greenhouse."

Mr. Scudder also called the Club's attention to a statement in Tutt's British Butterflies that there is not "a scintilla of actual evidence" to support the assertion that *Anosia plexippus* migrates southward in the autumn

in North America; whereas three specific cases are noted by Riley in his third Missouri Report, p. 151, and five others are reported in Scudder's Butterflies of the eastern United

States, pp. 729, 730, 1083, in addition to references to those given by Riley.

The rest of the evening was given to informal conversation.

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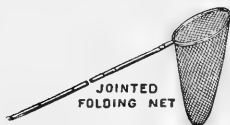
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PSYCHE.

TWO NEW MELANOPLI FROM LES CHENEAX ISLANDS, MICHIGAN.

BY W. S. BLATCHLEY, INDIANAPOLIS, INDIANA.

In August, 1897, after attending the meeting of the Economic Entomologists at Detroit, Michigan, I made a trip by boat via Mackinac Island to Chicago. From Mackinac, one of the most enjoyable and popular excursions is to the Snow (Les Cheneaux) Islands lying 12 miles to the northeast, near the northern shore of Lake Huron. These islands are a picturesque group, one hundred or more in number, covered with primitive vegetation, and separated by narrow channels. On several of the islands summer hotels are erected and are patronized by many of the disciples of Izaak Walton, who find in the network of channels the finny tribe in untold numbers.

La Salle Island, on which I spent a day, is one of the largest of the group—probably a mile and a half long by a half mile or more wide—densely wooded with spruce, hemlock, cedar, pine, birch and aspen, and with its shores abrupt and in most places 40 to 50 feet above the water level. Only along the immediate shore in front and on either side of the Elliott House have any clearings been made. Here, *Cir-*

cotettix verruculatus (Kirby), *Camnula pellucida* (Scudd.), *Melanoplus bivittatus* (Say), *M. atlantis* (Riley) and *M. femur-rubrum* (De Geer) were plentiful. In one or two other localities were secured small numbers of two additional species which have proven to be undescribed, and which, therefore, form the basis of the present paper.

Melanoplus huroni sp. nov. A brachypterous melanoplidan of medium or slightly above medium size; the female rather stout, with tegmina half the length of abdomen; the male more slender, with tegmina covering two thirds of abdomen; cerci tapering gradually from a swollen base to a slender apex; furcula very short, oblong, well separated, with rounded apices; the hind tibiae and lower face of posterior femora blood-red in both sexes. (Belongs to the *borckii* series as limited by Scudder.)

Male, dark brown, marked with fuscous above, beneath, clay-yellow. Head not prominent, the face testaceous, punctate with fuscous, the labrum and palpi yellowish, the occiput fuscous; vertex moderately tumid, distinctly elevated above the pronotum; eyes moderate in size, slightly more prominent in the male; antennae brownish red, darkening towards the apex, of equal length in both

sexes. Pronotum distinctly enlarging posteriorly (especially so in female) the disk fuscous or testaceous flecked with fuscous; the posterior lobe darkest; the lateral lobes with a post ocular piceous band on their upper half which extends to the metazona, the lower half testaceous; lateral carinae distinct but not prominent; the median carina sharp and distinct on the metazona, dull and indistinct on the prozona; front margin truncate, hind margin subangulate. Tegmina a little more than twice as long as pronotum, overlapping, sublanceolate, the dorsal and lateral fields angularly separated, brownish, flecked with fuscous, which along the median line of the lateral field is more or less aggregated into a row of small quadrangular spots. Hind femora stout, testaceous, faintly bifasciate with fuscous, the black of geniculation bordered proximally by a yellowish ring, the inferior face a bright blood-red; hind tibiae blood-red, the spines black except at base, ten or eleven in the outer series. Extremity of male abdomen strongly recurved, the subgenital plate terminating in a short conical protuberance. Supra-anal plate triangular with a narrow but deep median sulcus, which broadens basally and lies between sharp walls; furcula consisting of a pair of short, oblong, distant denticulations with rounded apices, lying just outside of the walls of the median sulcus; cerci tapering from a thickened base to a slender, bluntly pointed apex, the distal half slightly curved forward.

Female, much more robust and darker colored, the face, disk of pronotum, and outer face of hind femora, a dark gray where testaceous in the male; the fuscous spots of tegmina larger and more prominent.

Average measurements: Length of body, male, 20 mm., female, 28.5 mm.; antennae, male or female, 9 mm.; tegmina, male, 9.5 mm., female, 12.5 mm.; hind femora, male, 12.5 mm., female, 15 mm. Three males, four females, La Salle Island, Michigan, August 17, 1897.

One hundred yards west of the hotel

was a small clearing, an acre or more in extent, where a cabin had formerly stood. Along its margins and over part of its area grew clumps of the wild red raspberry (*Rubus strigosus* Michx.), and among the numerous remains of stumps were small bunches of wire grass and the trailing vines of the dewberry. Here *M. huroi* had its home, and the females, leaping lubberly from one bunch of grass to another, were readily secured, but the more sprightly males would often have to be chased quite a distance before their capture was effected. Quite a number of both sexes were taken, but unfortunately the cyanide bottle was old and failed to properly do its duty. When the box in which they were dumped was opened it was found that the majority of the females had "come to" and had so chewed and broken their dead companions, that only a few good specimens were left.

Melanoplus islandicus sp. nov. Below the medium in size, the tegmina ovate and a little shorter than the pronotum in both sexes. Cerci of male short, styliform, tapering gradually from a rather broad base; furcula a pair of very short, triangular denticulations. (*Puer* series as limited by Scudder.)

Male, dark wood brown above; yellowish below. Head not prominent; the face testaceous, varying to clay-yellow; the vertex but little elevated above the pronotum; eyes of both sexes of medium size, equally prominent; antennae uniform testaceous throughout; about three fourths the length of hind femora in both sexes. Pronotum expanding posteriorly but little in male, noticeably so in female, front margin truncate, hind margin broadly rounded; lateral carinae indistinct

in male, plainly evident in female; median carina distinct on metazona, obsolete or but faintly visible on prozona; disk a uniform dark brown in two specimens, the prozona blotched with fuscous in the remaining two; the lateral lobes with a piceous band on their upper two-thirds which extends to metazona, then setting in again on meso-pleurite continues about half the length of the abdomen, gradually fading posteriorly; bordered below on cheek and prozona with pallid, or testaceous in female, (ivory white in life, as is also the meta-pleurite). Tegmina uniform dark wood brown, narrowly separated dorsally, a very little shorter than pronotum, oval in outline, breadth $1\frac{1}{2}$ in length with apex subangulate; broader in female, breadth $1\frac{1}{4}$ in length with apex rounded. Hind femora light testaceous on upper and outer faces, faintly and obliquely bifasciate with fuscous; yellowish on inner and lower faces with the fuscous bars plainer on the former, geniculation blackish. Hind tibiae pale red, the spines black, ten in outer series. Extremity of male abdomen entire, moderately recurved; supra-anal plate triangular, a little longer than broad, the sides rather high, the median sulcus narrow, shallow, and terminating near the middle of the plate; the furcula consist of a pair of short, flattish triangular projections of the inner corners of the divided lateral halves of the last dorsal segment and

overlie the basal portion of the median sulcus; cerci styliform, a little shorter than the supra-anal plate, tapering strongly on basal half, gradually on apical half to the rather blunt apex.

Female, moderately robust, with colors duller than in the male.

Average measurements: Length of body, male, 15 mm., female, 20 mm.; antennae, male, 7 mm., female, 8 mm.; tegmina, male, 4 mm., female, 5 mm.; hind femora, male, 9.5 mm., female, 11 mm. Three males, one female, La Salle Island, Michigan, August 17, 1897.

Two or three males of *islandicus* were taken from shady places about the borders of the clearing, in which *huroni* was found, but the remaining six or eight secured were found along the margins of a narrow pathway which led through the dense woods down the eastern slope of the island. They would leap from the pathway into the mosses and liverworts bordering its sides, and there remain quiet while the intruder passed by. None were found at a distance of more than ten feet from this pathway, though especial search was made for them.

SOME NEW BYTHOSCOPIINAE WITH NOTES ON OTHERS.

BY C. F. BAKER, ALA. POLYTECHNIC INST. AUBURN, ALA.

Bythoscopus fagi Fh.

This is as good a species as any, and occurs sparingly throughout the northeast. It is small, length about 4 mm., the females rufous throughout, paler below, the males with the elytra much

darker. The last ventral segment is slightly shorter than preceding and very broadly bilobed. I have a number of males and females from the vicinity of Washington, D. C., and have seen others from New York and Massachusetts.

Bythoscopus variabilis Fh. var.
coloradensis n. var.

I give this name to a form found in northern Colorado which cannot be separated structurally from *variabilis*, though the color is quite distinctive. The head, pronotum, scutellum, and clavus basally, are yellow. Vertex with two small black spots. The pronotum has the depressed area behind each eye rufous. The sides of front, sternum, legs, and abdomen, are rufous. The elytra are rufescent with two hyaline spots on disc.

Described from numerous specimens taken in the foothills west of Fort Collins, June 15th to August 4th and at Forrester's Ranch on the Upper Laramie River in August. In both localities *pruni* was common with it. This variety was recorded in the Prelim. List Hemip. Colo. as *fenestratus*. I do not know that *fenestratus*, the type of which I have studied, has ever been found in Colorado.

The most important work yet to be done among our Jassoid insects, is the careful breeding of the various forms in large numbers. This is especially true among the Bythoscopids and Typhlocybids. In *Bythoscopus*, *Pediopsis*, and *Idiocerus*, such work, properly done, will be fraught with the most important results.

Bythoscopus truncatus n. sp.

Female. Length 4.5 mm. Color clear rufous, venter darker laterally. Legs pale

yellowish, fore femora rufous, middle and hind femora piceous. Elytra subhyaline, narrow costal and apical margins, and two irregularly transverse bands fuscous. Last ventral segment as long as preceding, truncate posteriorly. Face finely rugoso-punctate. Vertex, and pronotum anteriorly, coarsely irregularly punctured, the former with a faint median callosity. Pronotum posteriorly rather coarsely transversely rugose.

Described from a single female, collected by myself at the Michigan Agricultural College in 1888. At that time Mr. Van Duzee called this *sobrius*, but later settled that name on a very different form which I have since received from the northeast in numbers.

Agallia bigeloviae Baker.

The type of this species represents a small pale form. Farther west it becomes larger and frequently darker, when superficially it more closely resembles *sanguinolenta*. But the form of the last ventral segment of the female is distinctive. There are specimens in the Nat'l Museum from Death Valley and the Panamint Mts., collected by Mr. Koebele, and one from Los Angeles, collected by Mr. Coquillett.

Agallia sanguinolenta Prov. var.
inconspicua n. var.

There are in the National Museum two specimens of a very small form, pale yellowish throughout except two

black spots on vertex, and with hyaline elytra, which have the external genitals almost identical with those of *sanguinolenta*. They were collected at Los Angeles by Mr. Coquillett. I have also specimens from Arizona collected by Dr. Kunze. It will require the study of large series from various localities to decide whether it be really a form of *sanguinolenta*.

Agallia californica n. sp.

Length 3-3.25. Intermediate between *uhleri* and *sanguinolenta*, the former of which it closely resembles in coloration. Aciculation of pronotum finer than in *uhleri*, and punctation on vertex medially finer, sometimes scarcely distinguishable. Hind margin of last ventral segment in female trisinate, the median notch of varying size but always very small. The plates of the male are rectangular, black at tips, and stand in nearly the same plane, the apical margins often nearly in one straight line; outer apical angles obtuse, inner acute and minutely more or less produced. The valve is short and very broadly evenly rounded.

Described from several specimens in the Nat'l Museum, from Los Angeles (Coquillett), one from Nevada Co., Cal. (Koebele), and several from Tehachapi, Cal. (Morse). The form of genitals readily separate this from a large series of *sanguinolentus* and *uhleri* from Colorado and various parts of the East. It has a shorter-winged form also found at Los Angeles, and collected by Mr. Koebele in Placer Co., Cal.

Agallia lyrata n. sp.

Male. Length 3.5. Very similar to *californicus* but larger, the color and sculpturing nearly the same as in that species. Valve very short, shorter than in *californicus*, and broadly rounded. Plates very long, outer margins towards base strongly outwardly bent, beyond strongly narrowed and running parallel sided to the black rectangularly truncate tips; taken altogether, distinctly lyrate.

This species has been collected by Mr. Koebele in Nevada Co., Cal. Prof. Morse found it also at Wawona and Tehachapi, Cal. Apparently a very distinct species of the *uhleri* group.

Agallia heydeii n. sp.

Form of *A. constricta* but larger. Length, male 3.75, of female 4.25 mm.

Female: Face a fourteenth longer than wide. Front narrower than in *γ-notatus*, strongly constricted below the antennae. Vertex about as long at the middle as at the eyes. Pronotum not quite twice wider than long, length more than four times that of the vertex. Last ventral segment suddenly constricted at middle, beyond this evenly bulging, then rapidly narrowing to a shallowly notched apex; a semicircular depressed area on either side of apical half.

Color nearly as in *γ-notatus*. Brownish with lighter areas. Antennal cavities and spots including the ocelli, black. Vertex with two large black spots midway between median line and eyes. Pronotum with two large black spots on posterior half. Elytra with light veins on a brownish field. Sternum and basal portion of venter blackish.

Male: Plates with sides evenly incurved to middle; then enlarged towards the evenly rounded, very obtuse tips.

Described from many specimens col-

lected in the State of Vera Cruz, Mexico, by Rev. H. Th. Heyde. This is one of many interesting things which Mr. Heyde has turned up in Mexico, and I take pleasure in dedicating it to him. It is nearest *constricta* and *4-notata*, but differs from either in the structure of face and genitals.

Agallia mexicana n. sp.

More slender than *constricta* which it resembles. Length, female 3.5, male 3.25 mm.

Face about a twentieth longer than wide. Front proportioned as in *heydei*, strongly constricted below the antennae. Vertex as long at middle as at eyes. Pronotal width once and nine tenths the length, the length three and a half times that of the vertex. Elytra proportionally narrower than in *constricta*. Last ventral segment with hind margin slightly concave, its disc entirely lacking the characteristic depressed areas of *constricta*.

Color as in the paler form of *constricta*, except that the spots on vertex and pronotum are much larger, and the elytra are clearer gray.

Male: Valves narrowing to a slender but obtuse tip, the sides at about half their length more or less distinctly very obtusely angulated.

Described from many specimens collected in the State of Vera Cruz, Mexico by Rev. H. Th. Heyde. This belongs to the *4-notata* group, which includes *4-notata*, *constricta* and *heydei*. Of this it is nearest *constricta*, but differs as described above.

Agallia anomala n. sp.

Form of *novella* but smaller. Length of female, 3.5 mm. Face a twelfth longer than

wide. Front long and narrow, sides evenly curved. Vertex shorter at middle than at eyes, margin back of eyes broad, as in *novella*. Pronotal width once and three fourths the length, the length about five times that of the vertex. Last ventral segment broadly shallowly notched, the two lobes thus formed, evenly rounded.

Color pale greenish gray, sternum, legs, and venter pale yellowish. Face rufous, lighter towards margins; clypeus and lower part of front, antennae cavities, two diagonal streaks between the ocelli and front, and a spot extending inward from eyes and including ocellus, deep black. Vertex pale yellowish with two small dots between the median line and the eyes, and a large black spot at inner angle of eye. Pronotum very finely but distinctly shagreened, with three brown points, one at apex and two on disc. Elytra with dark fuscous clouding in outer claval cell, two antepical cells and third apical cell.

State of Vera Cruz, Mexico (Rev. H. Th. Heyde). This peculiar form is an interesting addition to the *novella* group.

Agallia producta n. sp.

Resembling *anomala*. Length of male and female, 3.5 mm.

Female: Face a twelfth longer than wide. Front broad, sides evenly curved from antennae to clypeus. Vertex of nearly the same form as in *anomala* and *novella*. Pronotal width about once and two thirds the length, the length five and a half times that of the vertex. Hind margin of last ventral segment medially strongly produced to an obtuse point, lateral angles broadly rounded.

Differing in color from *anomala* as follows: Face pale yellowish, minute dots adjoining the ocelli inwardly, antennae

cavities and spots on propleurae black. Medium spots on vertex much larger. Basal angles of scutel and two dots in front of the transverse line, black. Elytra without fuscous areas.

Male: Plates long, about two and a half times as long as total breadth at base, sides concave on basal two thirds, thence from the obtuse angle thus formed strongly narrowed to the tips. Differs in color from the female as follows: Head and scutel other than

markings bright yellow. Spots at ocelli larger and including ocelli. Vertex with a large median black spot at base. Pronotum with two points at apex and a median line, blackish. Veins of elytra somewhat darker towards base.

State of Vera Cruz, Mexico (Rev. H. Th. Heyde). This species belongs to the *novella* group but is very distinct from either *novella* or *anomala*.

THREE NEW COCCIDAE OF THE SUBFAMILY DIASPINAE.

BY T. D. A. COCKERELL, MESILLA, NEW MEXICO.

Aspidiotus (Diaspidiotus) coniferarum, n. sp. — ♀ scale 1-3 mm. diam., circular or nearly so, rather convex (about as in *rapax*), white, with the red-brown exuviae to one side of the middle. First skin usually exposed. A white ventral film.

♀ yellowish-brown, of ordinary form; no circumgenital grouped glands; median lobes close together, large, broad and low, rather like those of *spurcatus*; second lobe low and broad, subobsolete but marked by the wide depression between it and the first lobe, it resembles the same lobe in *betulae*, but is longer; third lobe a rounded prominence, hardly a lobe, as in *betulae*; three spine-like plates (gland-hairs) in the first interlobular interval; three, larger, behind the second lobe; these branch more or less, the last especially having two long lateral branches; a long and strong spine just beyond the third lobe, and another similar spine on the margin a good distance beyond. The two pairs of interlobular incisions are very well-formed and are like those of *betulae*. Anal orifice large, and only a short distance from the hind end. Lateral portions of caudal plate with numerous filiform (spermatozoon-like) glands.

The embryonic larvae, in the body of the ♀, are remarkably large, and have the legs and antennae well formed.

Hab. — Organ Mts., New Mexico. Detected by Mr. H. Casad on a small pine tree (doubtless *Pinus ponderosa* v. *scopulorum*) which was brought to Mesilla and used as a Christmas tree. The scales occur plentifully on the upper part of the trunk. *A. coniferarum* is more like certain European species than any found in America; it probably occurs far to the north, and belongs to the boreal or subboreal fauna, reaching its most southern limit, like some other species, in New Mexico. It is infested by a fungus.

Pseudoparlatoria noacki, n. sp. — ♀ scale 1-2.3 mm. diam., flat, or very slightly convex, circular or nearly so; stained with light coffee-brown, except the margins, which remain white, sometimes the whole scale being whitish; exuviae central to sublateral, rather large, exposed, first skin near margin of second, both skins orange-brown, varying to very pale greenish yellow, the first skin sometimes greenish with a yellow spot at each end. A white ventral film. ♂ scale smaller, broad-oval, flat, semitransparent white; larval skin large, slightly greenish,

tipped with yellow, some distance within the margin of the scale.

♀. Brown, of the general type of the genus. Five groups of circumgenital glands; caudolaterals of 16 to 18, cephalolaterals about 20, median seven. Plates and lobes much as in *P. parlatorioides*; the two projections between the median lobes are longer than the lobes, and subparallel; the median lobes are rounded at the ends, and their sloping sides if produced to a point would form about a right angle, the subbasal notches of *parlatorioides* are wanting; the other lobes etc., correspond closely with those of *parlatorioides*. The sides of the segments before the hindmost portion are curiously produced, the outlines of the produced portions rather resembling that of a human nose.

Hab.—On leaves of a forest tree, Campinas, Brazil, Jan., 1898. Collected by Dr. Fritz Noack, phytopathologist of the Instituto Agronomico do Estado de S. Paulo. It is a distinct species, easily recognized by the scale. The exuviae are sometimes quite green, and the scale may be snow white except in the centre. The scales mostly occur along the midrib on the under side of the leaf.

Mytilaspis perlonga, n. sp.—♀ scale long and narrow, 3.1-2 mm. long, hardly 1 mm. wide, convex, straight, very pale ochreous, exuviae shining apricot color, with a rather coppery tint, first skin exposed, second covered. ♂ scale similar but much smaller.

♀. Orange brown; median lobes fairly large but not much produced, their outline about that of a half-circle, the interval between them about as wide as the diameter of one; second lobes very broad and low; third a little more elevated than the second, and divided into two or three lobules; fourth replaced by some irregular serration of the margin. The true spines are rather small, and quite ordinary; but the spine-like gland-hairs are extremely large, quite stout, ex-

tending far beyond the lobes, and more or less beset with spinules at the end. There is one of these gland-hairs at the inner base of each median lobe, one (only one) in the first interlobular interval, one also in the second, and one in the third interlobular intervals, and one some distance beyond upon the margin. Anal orifice level with the hinder portion of the caudolateral group of glands. Five groups of circumgenital glands, median of 7, cephalolaterals 14, caudolaterals 14 or less. Rows of numerous transversely elongate dorsal glands. Antennae represented by rounded tubercles, emitting numerous bristles. The females contain embryos with well-formed legs and antennae.

Hab.—Campinas, Brazil, very numerous on the bark of small twigs of *Baccharis*, Jan., 1898. (Dr. F. Noack.) Nearly all of the specimens are infested by a chalcidid parasite. *M. perlonga* is a distinct species, easiest distinguished by the very large gland-hairs, of which there is but one in the first interlobular interval. There are a few *Lecanium baccharidis* on the same twigs.

PROCEEDINGS OF THE CLUB.

11 March, 1898. The 200th meeting of the club was held at 156 Brattle St., Mr. J. W. Folsom in the chair.

Mr. A. P. Morse of Wellesley, Mass., was elected president for 1898.

Mr. W. F. Fiske of Durham, N. H., was elected a member.

Mr. A. G. Mayer said that during a stay in the Figi Islands from November 6 to January 13, he devoted some time to collecting insects. Among Lepidoptera one finds several species of Euploeans that seem to be identical with Australian forms. There is one *Papilio* that is evidently a Queensland species, and also a *Terias* that is extremely common. It is probable that all of these butterflies existed upon the islands before the advent of white men.

The distribution of *Anosia plexippus* is peculiar. It is very common at Suva, Levuka, Loma loma, and Kadavu Isd, and in fact, seems to exist upon those islands where white men live. On many of the islands inhabited exclusively by natives it apparently does not exist. It is probable that this insect has been introduced into the group within recent years and has not yet reached many of the remote islands. - A species of *Asclepias* was found upon some of the islands where this butterfly is common. It is probable that it has been carried by commerce from island to island, and as there is but little commerce with islands inhabited exclusively by natives the butterfly has not reached them. Among moths, a species of *Utetheisa* allied to our *U. bella* was common upon the sandy atolls, although it does not exist upon the high rocky islands. A *Macrosila* and a hummingbird sphinx were also common.

Beetles were well represented by a number of weevils, Buprestids and Carabidae. There were also a few Staphylinidae, Elateridae and Cerambycidae. A species of *Cicindela* was very common along the roads near Suva.

Hemipterous insects are remarkably common and are represented by many species of *Corisiae*. There are also several species of *Cicadellina*, and a *Cicada*. A species of *Hylobates* is common upon the calm waters of bays and estuaries.

Orthoptera were common but seemed to be represented by but a few species. Grasshoppers of several species were found upon all of the islands. Walkingstick insects (*Phasmida*) were represented by several species, one of which was about twelve inches long. Others possessed wings and were smaller. The leaf insect *Phyllium lobiventris* is common upon the leaves of the guava but it resembles the leaves so closely that it is

extremely difficult to find. These insects are usually green in color and the broad flat fore wings are veined and colored so as to resemble almost exactly the leaves over which the insect crawls. Some individuals instead of being green are brown, like a withered leaf, and others are bright yellow, or yellow streaked with brown. Their individual variability is most remarkable. These insects are said to be nocturnal in their habits and certainly the best time in which to collect them is very early in the morning, just before sunrise.

Neuroptera were rare.

The insect fauna of the group is undergoing a change owing to the introduction of many exotic species, some of which thrive very well. This is especially noticeable at Suva where many moths and beetles etc. are found that are not seen upon other islands of the group.

Mr. S. H. Scudder exhibited specimens of *Acridium septemfasciatum* Serv. from, Pietersburg, South African Republic, which had been sent him for determination by Mr. W. D. Hunter of the University of Nebraska. They were said to be very destructive, flying some 200 yards above the ground, are very wild and cannot be "driven" like a smaller scourge appearing in former years; they first appeared in that region about seven years ago. He also announced the capture by Mr. F. H. Sprague of numerous fresh specimens of *Zunonia coenia* at Sharon, Mass., on July 25 and of *Atrytone logan* at Braintree, Mass., on July 17, 1897.

Mr. J. G. Needham said that he had noticed that the increase in the strength of the neuuration of the wings of Odonata was accompanied by an increase in depth of color and asked if any explanation could be given. In illustration he showed photographs of several species.

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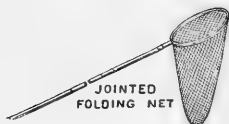
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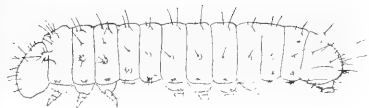
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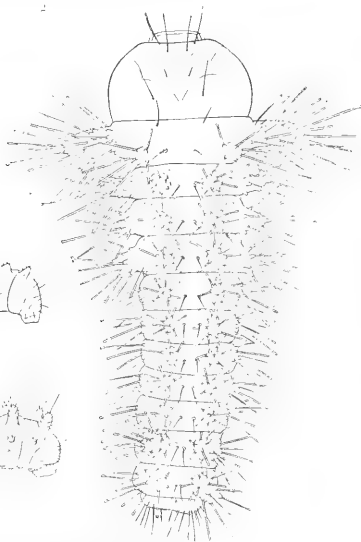
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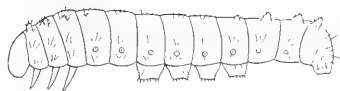
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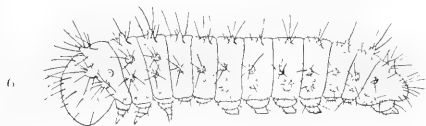
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SCUDDER.—Caterpillars of Papilionini.

PSYCHE.

A STUDY OF THE CATERPILLARS OF NORTH AMERICAN SWALLOWTAIL BUTTERFLIES.*—I.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Interesting as are the transformations of a butterfly in the three earlier periods of its life, marked off by such strict lines from one another, the changes which the same insect undergoes in shape, in color and in clothing in the different stages of caterpillar life alone, are scarcely less surprising. This is true to so marked an extent in the caterpillars of our swallowtails that if in their earliest stages they were only large enough to have all their peculiarities readily seen by the naked eye, more attention would long ago have been given them. It is also important on other grounds. Weismann has mentioned the desirability of studying the early stages of these caterpillars in particular, to acquire a knowledge of their phylogeny, and they have formed the subject of an extended but still incomplete paper by Gruber,† somewhat barren in results from its incompleteness, and in some particulars from its inaccuracy. The more

complete material now at hand, studied almost entirely from fresh objects, the extraordinary variety among our New England forms, and the curious fact that these cover almost the entire range of variation known among the caterpillars of Papilionini the world over lend special interest to such an enquiry.

I propose in the first place to give for each of the six species of our fauna, each representing a distinct genus, as succinct an account as possible of the several important changes; next, to summarize from this the leading lines along which the changes have occurred; and finally to draw from the facts such conclusions as seem admissible.

The caterpillar of *Laertias philenor* (Fig. 1.) at birth is uniformly cylindrical, of a uniform dark brown, covered with several rows of conical warts of nearly uniform size, most of them bearing a single bristle, a few, on the thoracic segments and just above the abdominal legs, more than one. In its second stage the shape and coloring are the same as before, but the clothing of the body is greatly changed, for all the warts bearing single bristles have dis-

* Reproduced with slight changes from the author's *Butterflies of the Eastern United States and Canada*, pp. 1234-1241.

† *Jen. zeitschr. naturw.*, xvii; *Papilio*, iv.

appeared, together with their bristles, and so have the bristles of the other warts, but in these latter instances the warts remain, and have become short, fleshy, often brightly colored filaments; while to take the place of the simpler warts a new and independent series of fleshy filaments has arisen between the two series which disappeared. The remaining stages are much the same as this, only the filaments at the extremities of the body grow longer and longer with each stage, more and more highly colored; a suprastigmatal series of coral red spots is introduced in the fourth stage on some of the abdominal segments; and finally, in the last two stages, the thoracic segments taper forwards markedly.

The new-born *Iphiclides ajax* (Fig. 2) is cylindrical, but a little larger in front than behind, of a nearly uniform dark leaden color, darker, however, on the front half than behind, covered with rounded warts arranged in several rows, a few at the extremities slightly larger than the others, most of them supporting a number of bristles, generally widely forked at the tip. In the second stage every trace of tubercles and bristles, forked or simple, has gone, excepting a few slight, spineless warts at the extremities, and in their place fine, excessively short hairs are scattered over the body; this has become tumid on the thoracic segments, and is transversely striped with uniform black and white or yellowish bands, of which there are many to a segment. In the third stage the hairs are even less ob-

servable, and the stripes have become finer and tremulous, while the incisure between the last thoracic and first abdominal segment is marked by a broad, black, velvety stripe, edged in front with white and behind with yellow. The fourth stage shows no special change. In the fifth the broad, velvety stripe becomes more conspicuous, because the ordinary stripes become more or less obsolete; and when full grown the latter often or generally persist only as transverse series of black dots on a nearly uniform green body, though the yellow stripes remain, at least on the sides.

In *Jasoniades glaucus* (Fig. 3) the infant caterpillar is cylindrical, slightly tumid anteriorly, of a dark brown or sometimes even velvety black color, a little paler beneath, the extremities lighter, and an oblique stripe in the middle above on each side, forming a sort of saddle-shaped whitish mark; the body is covered with several series of wart like tubercles, larger at the extremities than in the middle of the body, beset with bristles. In the second stage tubercles and bristles are gone, excepting at the extremities of the body, where they are relatively much reduced; the color and markings remain much as before, but are perhaps more diversified, and have added to them on the sides of many of the segments next the tubercles a minute bluish spot, that of the third thoracic segment (now more distinctly tumid) with a velvety black streak below it. In the third stage all the markings are still more distinct and

diversified, and the tubercles have almost entirely disappeared and been replaced by smooth, shining lenticles, while on the sides of the third thoracic segment the black spot and black streak have developed to a black annulus with a blue center. In the fourth stage the general color becomes at first a dark brownish olivaceous, with the same striking contrasts as before, but during the course of this stage this is replaced by a grayish green, and the saddle, which has been becoming yellow, fades and diminishes until a mere ghost remains; the first abdominal segment is edged behind with yellow, the lenticles have turned to colored spots, and on the third thoracic segment is seen at first a pair of roseate spots faintly edged with black, and a black line between them, afterwards becoming a single yellow spot, including below a luteous lenticle, above a velvety black streak, and in the middle a black-rimmed, turquoise spot. In the final stage the caterpillar becomes pure green above, pale bluish green below, and the only markings are a bright, transverse stripe of black and yellow at the hind edge of the first abdominal segment, a few rows of minute dark turquoise spots, and on the sides of the third thoracic segment a still further development of the markings, the whole now forming a rounded, quadrangular, greenish yellow spot, rimmed delicately with black, crossed above by a black bar, and enclosing below a black annulus with a turquoise centre.

In *Euphœades troilus* (Fig. 4) we

start in practically the same way as in *Jasoniades*, only the saddle is less oblique. In the second stage the caterpillar is plumbeous, with the lateral flaps of the pale saddle more distinct than the seat, the body paler below than above, and there is added a curving white streak below the middle of the sides of the thoracic segments, seeming to define better the tumid front portion of the body; bluish dots appear along the dorsal part of the segments, and on the third thoracic segment one at the side is velvety black, edged above and below with yellow; the tubercles are only distinct at the extremities of the body. The third stage hardly differs from the second, but the spot on the third thoracic segment is now larger and wholly rimmed with yellow. The fourth stage also closely resembles the preceding, but the tubercles are replaced by lenticles, one on the third thoracic segment black and glistening, and included in the black spot. The last stage is wholly different, the general color being a pure green, on which only the minor spots remain as links to the past, and reinforced by others which replace the lenticles; the spot of the third thoracic segment has altered; it is now a finely black-rimmed, large, orange and yellow spot, including a quadrate black nucleus below the middle, nearly half as large as the whole spot, and including within it posteriorly a shining black, blue-edged lenticle; a thin black line runs between this nucleus and the outer black rim in front; but an additional spot appears

on each side above on the first abdominal segment, a large, finely black-rimmed, rounded, orange spot seated at the posterior incisure on a fine black line which enlarges where the spot touches it; the two series of small abdominal spots have become distinctly turquoise.

In *Heraclides cresphontes* (Fig. 5) the young larva is provided with exceptionally large tubercles, which are largest at the two extremities, and especially on the first thoracic segment, and these are all thickly beset with bristles; the body is largest in front but scarcely tumid; the colors are very dark brown, more or less mottled, with a distinct white saddle and lighter extremities. Excepting that the front portion of the body is a little tumid, and that the tubercles become relatively less important, there is no change in the next two stages. In the fourth stage the front part of the body becomes distinctly tumid and at the same time develops an irregular, white, curving lateral band, setting off the tumidity to better advantage; the colors and patterns are otherwise the same as before, but the tubercles have become lenticles, and around them have clustered rings of brighter color, by which the body is much mottled. No further change is made in the final stage excepting that the colors are more varied, the whites have become more of a cream color, and the mottling is more noticeable, partly from the larger size; in

general the disposition of the markings is much as in the newly born caterpillar.

In *Papilio astyanax* (Fig. 6), finally, we have at birth a jet black caterpillar with a white saddle across the middle, and occasionally a white fleck or two in front of it; the body is cylindrical or nearly so, but the thorax shows a slight tumidity; it is tuberculate, with conical tubercles, beset with bristles; there is little inequality in the length of the tubercles, but those on the side of the body are dull orange. In the second and third stages we have a repetition of the same features in color, form and tubercles; the orange, however, becomes a little more vivid. In the fourth stage, too, the dark tubercles still remain but are relatively less important, and have at their anterior base a yellow or orange spot; while in the place of the orange tubercles are orange lenticles, and these and the other orange spots break what would otherwise be a broad, black, transverse band in the middle of each segment; for now the body has become green and is transversely striped with black in the middle and (more narrowly) at the front edge of each segment, and no sign whatever of the saddle remains; the form at the same time becomes more completely cylindrical, but the body tapers in front. In the last stage this general style of ornamentation and of form is kept, but the tubercles and lenticles altogether disappear.

DATE OF ISSUE OF LAST NUMBER OF PSYCHE.—The last, April, number of Psyche

was mailed on the morning of the last day of the preceding month, as is our custom.

DIPTERA FROM THE MESILLA VALLEY OF THE RIO GRANDE
IN NEW MEXICO.—II.

BY C. H. TYLER TOWNSEND, LAS CRUCES, N. MEXICO.

The present section of this paper is to record what appears to be the growing occurrence in the Mesilla Valley, in southern New Mexico, of species belonging to the tachinid subfamilies Phasiidae, Gymnosomatidae, and Ocypteridae. As pointed out in section I, *Gymnosoma* was not known in New Mexico previous to 1894, the only representatives of the above groups known before then being several hyalomyiid forms (belonging in the Phasiidae). Since 1894, *Gymnosoma* has turned up more commonly; and in 1897 both Ocyptera and, what is more remarkable, *Trichopoda* have been discovered for the first time in New Mexico. These occurrences are very interesting from a biogeographical point of view, and indicate the probable future occurrence and discovery in the Mesilla Valley not only of *Cistogaster* (which is allied to *Gymnosoma*), but also of *Xanthomelanodes*, a member of the Phaniidae, which is the remaining one of the four small primordial groups of Tachinidae. The flies of these groups are, as a rule (excepting the hyalomyiid flies), inhabitants of low moist regions in temperate and tropical latitudes. Their occurrence in the Mesilla Valley points to a spread of these forms from lower moister regions up the valley of the Rio Grande into New Mexico.

PHASIIDAE.

13. *Trichopoda histrio* var. *indivisa* Towns. One male, Sept. 3, and two females, August 25 and Sept. 2, on flowers of *Solidago canadensis*, on the acequia banks within the town of Las Cruces, all collected by myself in 1897. These are the first and only specimens of *Trichopoda* known from within the boundaries of New Mexico, and their discovery calls for an amendment of my statement on page 279 of the *Annals and Magazine of Natural History* (London), series 6, vol. xx, Sept. 1897.

The female differs from the male, aside from the claw and frontal characters, in the second segment being without golden pollen, while the third is golden pollinose except the wide anterior and posterior margins. The male has the third to sixth segments wholly golden pollinose; while the second segment is yellowish except narrow anterior and posterior margins, but not distinctly pollinose. The coloring of the wings is quite the same in both sexes. The male front at vertex is hardly twice as wide as the distance between the two posterior ocelli; while that of female is twice or two and one-half times as wide as this distance. The third and fourth segments of male, and fourth segment of

female, are narrowly brown on hind margin, showing the incisures.

It will be seen, by comparing descriptions, that the present specimens have (at least in the male) more golden pollen on abdomen than the San Rafael (Vera Cruz) specimen, thus indicating a tendency toward still another variety.

GYMNOSOMATIDAE.

(9) *Gymnosoma fuliginosa* Desv. One male, August 31; and three females, August 30 and Sept. 3; all on flowers of *Solidago canadensis* on acequia banks within the town of Las Cruces, taken by the writer in 1897. The number of specimens previously taken in New Mexico is seven.

OCYPTERIDAE.

(10) *Ocyptera euchenor* Walk. One male, August 31; and one female, Sept. 2; both on flowers of *Solidago canadensis* on acequia banks within the town of Las Cruces, taken by the writer in 1897. Length, 10 to 10½ mm. These are additional to the specimen taken by

Cockerell, August 5, 1897, on flowers of *Bigelovia wrightii* in the Mesilla Valley, and already recorded (Psyche, Dec., 1897, pp. 149-150).

Mr. D. W. Coquillett, in his "Revision of Tachinidae," calls this species *O. carolinae* Desv. I have no copy of Desvoidy's *Myodaires* at hand to verify this reference.

14. *Ocyptera euchenor* var. *dosiades* Walk. One female, August 25, on flowers of *Clematis ligusticifolia*, on acequia banks within the town of Las Cruces, taken by the writer in 1897. Length, 7 mm.

This is not the *dosiades* of Mr. D. W. Coquillett, in his "Revision of Tachinidae," as it has the two pairs of marginal macrochaetae, as well as the smaller apical pair. It is the form which I have heretofore always referred to *dosiades* Walk. When Mr. Coquillett adduces some evidence to show that Walker's types of *dosiades* possessed no apical pair of bristles, and but one marginal pair, I will revise the present determination.

DESCRIPTION OF AN UNUSUAL SAW-FLY LARVA BELONGING TO THE XYELINAE.

BY HARRISON G. DYAR, WASHINGTON, D. C.

As far as I can ascertain there is no description extant of any larva of the subfamily Xyelinae of the Tenthredinidae. Cameron says in his monograph that the larvae are without feet, and

Dalla Torre in his catalogue gives a note stating that *Xyela julii* lives on *Betula alba*, but without reference to any description.

In the vicinity of New York there has

been known to collectors for some time a curious larva resembling the excrement of birds. It is found on the young tender leaves of the hickory and butter-nut in May and disappears by the end of that month, not to reappear till the following season. The larva is solitary, though when abundant, several may occur on one leaf. It is nearly footless, the short feet being only feebly functional and the larva wriggles around very like a *Lyda* when out of its web. It rests by curling around a portion of leaf or stem in a single spiral and only spins a few inconspicuous threads of silk. It lives freely exposed, protected, doubtless from birds by its resemblance to a noxious object. It is very unusual for saw fly larvae to be highly specialized enough to mimic particular objects; but in this case the resemblance is remarkably exact, as New York collectors will testify.

Mr. W. H. Ashmead, in a paper entitled "a synopsis of North American Xyelidae," read before the Washington Entomological society in Dec., 1897, described two new genera and gave a generic table of this group. He has kindly furnished me with an advance copy of this table which is given below.

Pleuroneura aviingrata n. sp. ♀ Shining blue-black, submetallic. Labrum emarginate, with a terminal white line and pair of large round white spots; palpi partly whitish. Joint and extreme base of posterior femora and last four joints of posterior tarsi white. Abdomen and legs shining, head and thorax dull. Nervures black, wings nearly hyaline,

a trace of smoky bordering the veins of fore wings. Hind tibiae hairy and with six long spurs. Length 13 mm.; expanse of wings, 29 mm.

Larva. Last four stages observed.

Stage, width of head 0.8 mm. Head shining brown. Body shining brown dorsally, milk white subventrally, setiferous tubercles black, not very large, two transverse rows per segment in dorsal aspect, three in lateral view. The segments are 4-annulate, a row of four or five tubercles on each side of second (spiracular) and third annulets, a half row of three tubercles on the lateral portion of the fourth annulet; subventral folds with scarcely distinguishable rudimentary tubercles. Legs colorless; a narrow obscure white dorsal line. Feet all unusually small; thoracic ones black ringed; abdominal ones on joints 6-12 and 13; above the anus a pair of low conic setiferous warts. The tubercles usually have two setae each.

The larva wriggles over the leaf when it wishes to move, using the feet poorly.

Next stage. Head 1.5 mm. wide, shining brown, eye and jaws black. The white color formerly confined to the subventral region is now present also as dorsal patches between joints 4-5, 5-6, 11-12, and top of joint 13 posteriorly. Tubercles brown except the two lower of the anterior row which are still black. Otherwise as before.

Stage before last. Width of head 2.1 mm. Much the same but the brown and white still more mottled; a broken white dorsal line; nearly all the dorsum of joint 5 white.

Last Stage. Head rounded, dark brown, shining, shading paler in the sutures of mouth parts; width 2.5 mm. Antennae brown, pale ringed, palpi black. Thoracic feet black at base; then pale with testaceous rings. Segment indistinctly 4-annulate, the tubercles watery, concolorous and obscure, nearly obsolete and difficult to distinguish. Dorsum shining olivaceous brown; a broken narrow white dorsal line; a white patch on joints 3, 4, on 6 centrally to 11 centrally, patches on 12,

13 and anal plates, milk white from spiracles to feet, extending higher on joints 4-6 and 11-12, mottled. End of joint 13 swollen above, light brown; joint 3 a little enlarged dorsally. In the natural position of rest, curled spirally around a leaf petiole, the two largest white patches adjoin each other.

Enters the earth without ultimate stage.

Single brooded, feeding only on immature leaves.

Staten Island, N. Y., June 1; Bellport, Long Island; Bedford Park, N. Y., May 25; Fort Lee and Plainfield, N. J., May 16 (the youngest one).

Table of genera of Xyelidae.

(By W. H. Ashmead.)

1. Front wings with the intercostal vein uniting with the subcostal; hind wings with one complete submarginal and one discoidal cell. 3

Front wings with the intercostal vein separated, distinct from the subcostal; hind wings with two complete submarginal cells and one discoidal cell. 2

2. Antennae 9-jointed, the six terminal joints very short, together not longer than the scape and less than half the length of the third joint; clypeus with a median emargination; claws with an erect tooth before the tip *Macroxyela* Kirby.

Antennae 10-jointed, the seven terminal

joints very short, together not longer than the scape or less than one fourth the length of the third joint; clypeus triangularly produced in the middle; claws bifid; all tibiae very spinous, hind tibiae with 4 long spurs beneath between middle and apex

Megaxyela Ashm.

(type *X. major* Cress.)

Antennae 12-jointed, the nine terminal joints much shortened, together much shorter than the third joint; both transverse radial nervures originating from the second cubital cell; clypeus and tibiae as in *Megaxyela*; claws with a large erect tooth before middle

Pleuroneura Konow.

3. Antennae 12-jointed, the nine terminal joints slender, lengthened, together as long or longer than the third joint; claws long, slender, with a very minute, nearly obsolete tooth beneath a little beyond the middle 4

4. Front wings with both transverse radial nervures originating from the second cubital cell, rarely with the second transverse radial interstitial; clypeus with a median ridge which is slightly extended beyond the anterior margin, but scarcely triangularly produced *Manoxyela* Ashm.

(Type *M. californica* Ashm.)

Front wings with the first transverse radial nervure originating from the second cubital cell, the second originating from the third cubital; clypeus triangularly produced anteriorly *Xyela* Dalman.

RUDOLF LEUCKART.

So many and such valuable contributions to our knowledge of the morphology and physiology of insects have come from the laboratories of the late Professor R. Leuckart of the University of Leipzig, that a few words of appreciation of this master zoologist's labors and of regret for his loss can not be amiss in the pages of *PSYCHE*. Dr. Leuckart, who died in February in his seventy

sixth year, was a zoologist of extraordinary range of study, touching in his work the anatomy and life-history of the most widely separated groups of animals, working indeed through the whole animal realm from Amoeba to Man. His largest contributions are those to the knowledge of the parasitic worms, but his enlightening studies of the micropyle and fertilization of insect eggs (1855), the reproduction and development of the Pupipara (1858), the alternation of generations, and parthenogenesis among

insects (1858 and later) and his exhaustive studies of the anatomy and life-history of the honey-bee (together with other contributions) have made his name a familiar one to entomologists. In passing, it is to be regretted that entomologists as a rule have far too little acquaintance with "general zoologists" and their work, although it is a fact, and one which we must admit with humiliation, that most of our knowledge of insect morphology and physiology has come from these general zoologists, men who are not professed students of insects, i. e. entomologists.

As a teacher Leuckart has been for years the best known and most besought zoologist of the world. If the names of the living well-known zoologists of Europe (excluding England and France) are called, surprisingly

many of them are in the list of Leuckart's students. Claus, Weismann, Bütschli, Hatschek, Chun (who succeeds to Leuckart's chair) Korschelt, Kräpelin and others nearly as well known have worked in Leuckart's laboratories. In America, Whitman, Mark, Baur, Herrick, Stiles, Patten, Pratt, Wood, Parker, Child and others are one-time students of Leuckart; and of the investigations made by these and the scores of other students in Leuckart's laboratories, a majority has had for subject the morphology of insects.

Of Leuckart's relation to his students it is only necessary, and is no exaggeration, to say that he was beloved by all of his students, and that the memory of him is a lasting inspiration to each of them.

Vernon L. Kellogg.

Leipzig, March, 1898.

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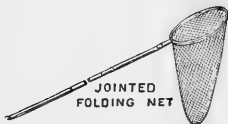
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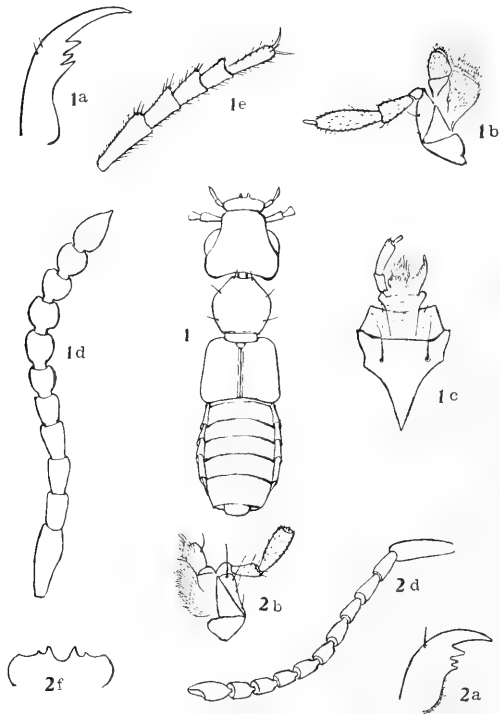
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WICKHAM—MYRMECOPHILOUS COLEOPTERA.

PSYCHE.

ON COLEOPTERA FOUND WITH ANTS. (FOURTH PAPER.)

BY H. F. WICKHAM, IOWA CITY, IOWA.

The following notes are intended to be supplementary to those which I have contributed to earlier numbers of Psyche. While fragmentary, they will add something to the knowledge of our native Myrmecophiles.

A reëxamination in May, 1896, of the nest of *Formica obscuripes* (at Iowa City) from which the specimens of *Platymedon laticolle* had been taken in preceding years, showed that for some cause the ants had deserted it and moved to another locality a few feet distant. On digging into this new nest it was seen that the *Platymedon* had followed its host since more than twenty specimens were obtained. *Anthicus melancholicus* had also accompanied the ants to their new home, but I found them more abundant in the old deserted mound than in the fresh one. Early in 1897 I again went out to visit this colony and found it so weak that I judged it better not to disturb it, particularly as no other colony of this species has ever been noticed in this part of Iowa. Lately Mr. A. W. Hanham sent me specimens of the same *Platymedon*, captured with *F. obscuripes* near Brandon, Manitoba; he took them

by placing flat stones on the nest, when on his return a week later (April 23rd) the beetles were found beneath them. Some, he writes, got away before he could catch them — and indeed the little creature is very quick in its motions and makes the most of the opportunities for concealment afforded by the debris composing the mound. In the same nest Mr. Hanham took large numbers of the case-bearing larvae of *Coscinoptera dominicana*, April 16th. The cases, he says, were nearly as numerous as the ants and were generally attached to the twigs of which the mound seemed to be chiefly composed. The first beetles were disclosed May 17th and are of the densely pubescent type noticed by Dr. Horn as belonging more particularly to western specimens.

A species of *Stilicus* sent from Winnipeg by Mr. Hanham seems undoubtedly new and is described below. It is said to be found under stones in company with ants through the earlier part of the season, having been taken at various dates between April 22nd and May 25th. Mr. Hanham writes, in reply to a query, whether the insect should,

properly speaking, be considered myrmecophilous — “I should say they are certainly a species living with ants. In the early season I find the railway lines, in some places, the best collecting ground. On both sides of the track are stones, under most of which are ants, representing one species and of much the same size and color as these beetles. There have always been ants with the beetles taken, but sometimes even large colonies of ants have furnished no specimens of the *Stilicus*, though as soon as I got to distinguish the beetles from the ants and to know where to look for them, I would usually get one or a pair, if not more, from each nest, sometimes as many as half a dozen. I have also taken it rarely, under stones, in September.”

The evidence is such that we must conclude that the beetle is in some way connected with the ants, since it shows such preference for their company. While other species of *Stilicus* are found under stones in the spring, it has never been noticed that they are confined to the vicinity of ants' nests. I have therefore included the insect under consideration in our list of myrmecophiles and have drawn up the following description. The name is proposed in recognition of the careful labors of its discoverer among the insects of Manitoba.

S. hanhami n. sp. Much stouter than *S. dentatus*, blackish clothed with yellowish or golden recumbent pubescence. Antennae, mouth-parts, prothorax and legs reddish brown, elytra of about the same color as the

prothorax but bearing a large suturo-basal picescent cloud. Abdomen above black, margin paler, tip still lighter in color. Body beneath piceous except the prothorax which is reddish brown and the median and apical tracts of the abdomen which are pale. Head large, subquadrate, sides behind the eyes feebly arcuate, hind angles rounded, base deeply sinuate; above closely punctured, each puncture with a golden hair, forming so close a covering as to obscure the sculpture, under side with a distinct smooth impressed median line, the punctuation otherwise resembling that of the dorsal aspect. Antennae stout, first joint longest, second to fifth longer than wide, sixth to tenth nearly globular, eleventh longer than the tenth and pointed at tip. Teeth of labrum small, slender and prominent. Prothorax broadest in front of middle, sides broadly rounded and narrowing from this point to base which is truncate and with a distinct basal marginal line, hind angles not defined; anteriorly the prothorax narrows rapidly to apex, the sides straight or very slightly sinuate. Upper surface convex, rather shining, the punctuation finer than that of the head, not dense, each puncture with a golden hair. Lateral margin with two long bristles and a shorter one near each front angle. Median line distinct. Prosternum carinate, sides punctured and apparently finely transversely rugose. Elytra broader than the prothorax, punctures fine with hairs like those already described. Abdomen with broad distinct side margin, finely moderately closely punctate and hairy, sides bristly, the bristles on the last three (visible) segments much longer than the others. Under side punctured and pubescent, the golden hairs mixed with numerous longer black ones. Legs punctured and pubescent. Length (total) 4 mm.

A specimen was sent to Captain Casey who writes that it is near *opaculus* Lec., but much stouter with a larger

head more deeply sinuate at base. The plate will give an idea of the more salient features, the figures being drawn by Mr. P. C. Myers and the author. Fig. 1 is an outline of the type specimen, a is the mandible, b the maxilla, c the labium (in which the palpus is shown on one side only, the paraglossa on the other), d the antenna and e the hind tarsus. Figs. 2a, 2b, and 2d represent hitherto unfigured details of *Platymedon laticolle* which are of interest in this connection. It will be noticed that the terminal antennal joint is sinuate or somewhat ogival at tip. The mandibles are stouter than in *Stillicus hanhami*. The fourth joint of the maxillary palpi is extremely minute and scarcely visible except by careful preparation. The four teeth of the labrum (fig. 2f) are unequal, the outer being much smaller than the inner.

A nest of *Lasius niger* was examined at Iowa City on May 5th. The galleries

were in and under old logs. Running with the ants were seen two individuals of *Myrmobiota crasicornis* Casey. They are difficult of detection owing to their habit of keeping close to their hosts and mingling with the moving mass. My other specimens of this beetle were taken in August so that this record points to the probability of hibernation or of a double brood.

During a six weeks' trip to Colorado, some effort was made to add to the records of myrmecophiles, but the season was so far advanced that but little success was achieved. At Colorado Springs two species were taken, which, with their hosts, have been identified by Prof. Jerome Schmitt. These were *Batrissus frontalis* which was found in the runways of *Lasius claviger* beneath a log; and *Batrissus globosus* which occurred in a colony of *Camponotus herculeanus*.

A STUDY OF THE CATERpillARS OF NORTH AMERICAN SWALLOWTAIL BUTTERFLIES.—II.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

From these statements we see that there is a somewhat general uniformity of type in the earliest stage of larval life among the Papilionini, while there is an extraordinary diversity in the same caterpillars when full grown. Some of them alter very much less than others, some assume the mature aspect by slow degrees, and others at a start and at very different periods of life.

Thus maturity may be said to be assumed at the second stage by Laertias and Iphiclides, at the fourth by Heraclides and Papilio, in the course of the fourth stage by Jasoniades, and not until the final stage by Euphœades. This assumption of maturity consists in several distinct features which *in general* are correlated: the form of the body, the broad features of the coloring

of the body and the loss of the juvenile armature. In only one instance, *Papilio*, are the tubercles of the larva retained (and here only for a single stage) after the adult form and markings have appeared; and, excepting *Laertias* where the markings are almost null through life, *Heraclides* is the only example where the ornamentation of the body of the adult in any way resembles that of the newly born caterpillar.

There are several distinct lines along which changes have occurred, permitting readier comparison between allied types and to set this forth more clearly the facts are here tabulated, the numerals representing the stages.

From this it would appear to be tolerably clear that the primaeval caterpillar of the *Papilionini* was covered with rows of fleshy, mammiform tubercles beset with bristles, and that these were retained through life; but that in the gradual development of the group

these were lost, first at the final stage as we now find it in *Papilio*, afterwards at successively earlier and earlier stages; the loss consisting, first, in the removal of the bristles, afterwards in the lowering of the tubercles until only smooth and shining lenticles remained, as now in the full grown caterpillar of *Heraclides*; these again, as in several genera, were replaced by colored spots, some of which in caterpillars so far developed as *Euphoeades* and *Jasoniades*, assumed special forms.

So when we come to the general color, it may be fairly presumed that the early caterpillar was of a dark color—in no way green as *Weismann*, from his study of the *Sphingidae*, seems to think all young caterpillars were; probably of a uniform dark color with a tendency toward a deepening of the tint of the region about the third thoracic segment (which early assumes a special importance in these caterpil-

	Laertias.	Iphi-clides.	Jasoniades.	Euphoeades.	Heraclides.	Papilio.
Tubercles large and bristly	1	1	1	1	1	1-3
“ diminished, often without bristles			2	2-3	2-3	4
“ changed to lenticles			3	4	4-5	4
Lenticles changed to spots	2-5	4	4	5		5
No conspicuous tubercles	2-5	2-5	3-5	4-5	4-5	5
Filaments	2-5	0	0	0	0	0
Body pretty uniformly cylindrical	1-3	1	1	1	1	
“ slightly tumid in front			2		2-3	1-3
“ distinctly “ “		2-5	3-5	2-5	4-5	
“ tapering in front	4-5					4-5
Color almost entirely brown	1-5	1				
“ dark, saddled with light			1-4 $\frac{1}{2}$	1-4	1-5	1-3
“ transversely striped with black and bright		2-5				4-5
“ almost entirely green			4 $\frac{1}{2}$ -5	5		
Curving lateral stripe in front	0	0	0	2-4	4-5	0
Bright spots in rows on abdominal segments	2-5	0	2-5	2-5	0	2-5
A thoracic ocellus	0	0	<2-5	<2-5	0	0
Special markings on first abdominal segment	0	0	4 $\frac{1}{2}$ -5	5	0	0

lars), and also about the seventh abdominal segment, by the tendency of both markings and dermal appendages to assume a polar arrangement in elongated forms. By this means arose through the intensification of these contrasts the lightening of the middle parts of the body to form a saddle-shaped, whitish patch—a marking surely of great antiquity in swallow-tail caterpillars, since it is now found at birth in four of our six genera, and a fifth shows a tendency toward it. This style of marking has been retained throughout life in *Heraclides* only of all the members of our fauna; and as it is in just this genus alone that the lenticle-traces of the tubercles persist to maturity, we have certainly in *Heraclides* the perpetuation of a very antiquated type.

That in *Papilio* we have also a very persistent type may be judged from the great stability of the upper tubercles, which are even not lost until after the assumption of the changed livery of maturity,—a livery which owes a part of its variety and enlivenment to exchange of some of these tubercles for bright colored spots; these break up the transverse black stripes in a variable degree, and the stripes themselves appear to be but little more than retention of parts of the original color (fixed at the particular spots they occupy by the central position of the black tubercles) when the green livery of adult life is assumed. For it seems to be a green resembling the green of the leaves upon which the caterpillar lives, that is the ultimate aim of most *Papilio*-

onid coloration. In caterpillars of their size other colors would be too conspicuous for their advantage, and variation in this direction would be natural. Moreover, it is the color reached or partly reached, in several different ways, as the development of the other types show; thus in the other striped caterpillar, *Iphiclides*, the stripes grow obsolescent toward maturity and leave the caterpillar more completely green.

We may then trace several lines, to a certain extent parallel, along which the modification of the caterpillars of *Papilionini* has developed, parallel at least in that the loss of the juvenile bristles has been universal but at different stages; also that the loss of the juvenile tubercles has been universal though not always complete, their loss being generally made good by lenticles and these by spots; and sometimes, by acceleration, a phyletic stage is set further and further back and finally, perhaps, crowded out.

One of these lines, very distinct from the others, is found in *Laertias*, which has developed to so high a degree that its juvenile bristles, themselves exceptionally simple, are completely lost with the earliest stage; so, too, most of the tubercles; but here a very curious change occurs: those which are lost are replaced in new positions by others entirely different, which take on a more elongated form and become more properly fleshy filaments; while those which remain assume also the new development. The dark and almost uniform color of the larva throughout life is to be explained probably by acceleration;

it is the mature color thrust back into the juvenile stage, to the obliteration of any trace of the saddle which once may have prevailed there; and is in keeping with the present almost complete assumption of the mature characters at the second larval stage. In support of this position I would point out that traces of the saddle still exist in the mature forms of other filamentous caterpillars of Papilionini allied to *Laertias*, — *Ornithoptera*, *Menelaides*, etc., indicating a still larger development of the same in the earlier stages of the types with which, unfortunately, we are not yet acquainted. In *Laertias*, then, the saddle has been crowded back out of existence.

Another line of nearly as high development we find in *Iphiclides*, where the extraordinary bristles and tubercles are lost with the very first stage and maturity marks the second. Here again no saddle appears, the only trace of it left being in the slight deepening of the color in the new-born caterpillar near the extremities of the body; here I conceive that the phyletic stage marked by the saddle and formerly developed in later stages from the incipient contrasts of the first, has been pushed back without invading the first until it is entirely skipped.

A third line is represented by the remaining genera in which the saddle is definitely formed and becomes a marked feature of the earliest stages, to be lost only at a comparatively late period of life, — in one instance, *Heraclides*, not at all. Its loss, however, is effected in two very different methods,

as already pointed out, in *Papilio* and in the other genera, indicating lines along which future strikingly different processes may go on with widely different results; — in curious contrast to the somewhat similar results following quite different lines which we see in *Iphiclides* and *Papilio*. In *Euphœades* and *Jasoniades* we see also the development of special and complicated markings from the simple spots which have replaced the tubercles; traces of the same may be seen in *Heraclides*.

This review has but imperfectly shown what curious and striking distinctions in form and coloring are possible, distinctions which indicate within the history of single lives the immense phyletic changes that have occurred within the group. These changes are far greater both in structure and in design than can be proved to have occurred in other phyletic types among butterflies, to which have been universally accorded by the most conservative of systematists the rank of genera. Shall we refuse to recognize and so consign to oblivion the more interesting, more important and more obvious differences which here obtain by classing all the forms under one, wide-reaching generic name? It were a veritable travesty of Nature.

EXPLANATION OF PLATE 5.

- Fig. 1. *Laertias philenor*.
 2. *Iphiclides ajax*.
 3. *Jasoniades glaucus* (After Gruber).
 4. *Euphœades troilus*.
 5. *Heraclides crespontes*.
 6. *Papilio astyanax*.

THREE NEW ALEURODIDAE FROM MEXICO.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

The following three species, which are more than usually interesting, were collected by Prof. C. H. T. Townsend, and sent to me by Dr. L. O. Howard. In the genus *Aleurodes*, the best characters are derived from the pupa; and, in fact, the adults of very many species are still unknown. In *Aleurodicus*, on the other hand, we get our specific characters from the imago, and the pupae are all much alike. That this sort of difference should obtain between two so nearly allied genera, is a matter of much interest.

Aleurodicus iridescens, n. sp.—Agrees with *A. asarumis* in having some blackish coloration at the forking of the wing-vein, but differs in having the body and legs a deep chrome yellow, and the eyes not divided. Length of anterior wing 2 mm.; wings noticeably iridescent; a blackish line on the costa. Pupae along the midrib of the leaf, as in *Aleurodicus pulvinata* (Maskell, as *Aleurodes*), surrounded by abundant cottony secretion. Pupae dark grey or plumbeous, varying to brownish, structural characters as usual in the genus. Vasiform orifice semicircular; operculum very broad, broadly truncate at end. Four large round orifices on each side of the abdomen, some distance from the margin, but not nearly so large as Maskell figures for *pulvinata*; four very much smaller orifices in the caudal region, laterad of the vasiform orifice, the two hindmost nearer to each other than are the anterior ones; two of the large orifices at the cephalic end, and also four small ones as in *pulvinata*, but they are very minute.

Hab.—Ocean beach between El Faro and San Pedro, Tabasco, Mexico, June 12, 1897, on "Jicaco," a bush with large leaves growing on the sand flats. (Townsend.) Div. Ent. 7824.

Aleurodes mirabilis, n. sp.—Pupa (late larva?) $1\frac{1}{2}$ mm. long, after boiling transparent and colorless, except some brown stains in the thoracic region. Mouth-parts distinct and well-formed; rostral loop short; legs present, very stout, with small hooked claws. Form oblong, quite elongate, with a border densely dotted with round glands; anteriorly this border is very narrow, and at the extreme hind end it ceases, but all along the sides it is extremely broad. The cephalic portion of the insect, the hind end, and the lateral margins within the border, are also densely dotted with glands. Abdomen distinctly segmented, but the segmentation does not extend to the border. On each side of the abdomen are four curious large glandular processes, of the type of those in *A. holmesii* Mask. Lingua trowel-shaped, extending considerably beyond the broad operculum; at each side of the base of the lingua is an angular prominence. The general type of these parts is that of *A. pulvinata* Mask., but while the lingua is equally long, it is in our insect gently bowed out at the sides; and the two bristles at the end of the lingua in *mirabilis* are not nearly so long as in *pulvinata*.

Externally, the insect appears as a large mass (5 to 10 mm. long) of snow white cottony tufts, irregularly disposed, from the midst of which spring many very long curved white threads. The pupa itself is entirely covered.

Hab.—Boca del Usumacinta, Tabasco, Mexico, July 8, 1897, on "Laurel," which is not our plant of that name (Townsend.) Div. Ent., 7984. This remarkable insect resembles *Aleurodicus* several respects; when all its stages are known it will probably be referred to a new genus.

Aleurodes vinsonioides, n. sp.—Pupa of an intense black, even after boiling. At one

end, far apart from each other, are two small round orifices. Margin minutely beaded with brown. The pupa has the usual oval form, and is hardly over imm. long, minutely transversely ribbed down the middle of the back; with twelve broad ribbon-like rays of glassy secretion, not much shorter than itself. These rays are of a bright lemon yellow, except at their ends, which are white. Larval skin attached to dorsum of pupa.

Hab.— Frontera, Tabasco, Mexico, on leaves of a tree having small white flowers. (Townsend.) Div. Ent. 7669. Allied to *A. stellata*. The insect looks like a coccid of the genus *Vinsonia*.

Mesilla Park, N. M.

April 7, 1898.

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DR. PACKARD'S Guide to the study of insects has passed through many editions and has been for a long period the most successful and serviceable manual the American entomologist has had; the classification of insects was its foundation. The learned author now comes forward with a Text book,* constructed on a totally different basis; there is scarcely a word of classification in it, but only the facts forming the basis of classification: the external and internal structure, the embryology, and the metamorphic changes; that is, it is morphologic instead of taxonomic, to serve the present needs. It is the book for the day and is sure to command attention and come into general use. Numerous special bibliographies scattered throughout the book will prove of great service; they should, however, have been listed in the table of contents or separately, and the index is not so full as one could wish. There

* A text-book of entomology, including the anatomy, physiology, embryology and metamorphoses of insects, for use in agricultural and technical schools and colleges, as well as by the working entomologist; by A. S. Packard. 17 + 729 pp., 654 figs. New York. The Macmillan Co. 1898. \$4.50.

is too little room in our small journal for the fuller notice it deserves, but we strongly advise its purchase by every entomologist, as a marvellous storehouse of facts, where the latest researches find a place.

JOSEPH ALBERT LINTNER.

A DISPATCH from Rome, Italy, announcing the death of the state entomologist of New York, was published in the newspapers on the very day we received his twelfth Report on the insects of New York, a volume of more than a hundred and fifty pages, and, like all of his papers, filled with the proof of painstaking conscientious labor. Let us hope his successor will prove as diligent and faithful.

PROCEEDINGS OF THE CLUB.

8 APRIL, 1898. The 201st meeting of the club was held at 156 Brattle St., the President in the chair; Mr. J. W. Folsom was chosen secretary pro tem.

Mr. S. H. Scudder exhibited the North American species of Scudderiae and briefly summarized the result of his recent studies upon that group. Thirteen species are known, of which one necessitates a new genus, *Platylyra*. All the eleven species of Scudderia are closely similar to each other, with a few striking exceptions, and fall into four groups, based especially upon the structure of the male genitalia, of which drawings were shown. The species *septentrionalis* and *forcipata* are remarkably peculiar in respect to their accessory genital organs. Five species occur in New England, of which *furcata* is found across the continent, and *texasensis* ranges as far west as Utah.

Mr. J. W. Folsom said that nothing had hitherto been published concerning the Collembola of Japan, but showed specimens and figures of three new species from Tokyo.

(*Achorutes communis*, *Xenylla longicauda*, and *Seira japonica*) which were collected by Dr. Seitaro Goto and brought by Prof. Mitsukuri of the Imperial University.

Some discussion followed upon the geographical distribution of Collembola. Mr. Folsom observed that in an unusual number of cases the same species has been recorded from most widely separated regions of the earth; *Achorutes armatus*, for example, appears to occur throughout Europe and in California, Massachusetts, Uruguay, Valparaiso, Siberia, Sumatra and Greenland. It must be said, however, that the species of Collembola have too often been imperfectly identified.

In response to remarks by Mr. Scudder upon the Collembola of Greenland, Mr.

Folsom stated that a number of nearly allied species are found in this vicinity which pass the winter in the adult condition and which, though often frozen and apparently lifeless, readily regain activity upon exposure to warmth.

Mr. A. P. Morse said he had received from Mr. H. K. Burrison of West Newton, Mass., a fresh, active and adult specimen of *Conocephalus dissimilis*, which was found about the middle of last March in a mass of spinach. The dealer from whom the vegetable was obtained was unable to state whence it came, except that it was from the south. Mr. Scudder said that the insect had been rarely reported north of Maryland, but had been noted from southern Connecticut and New York.

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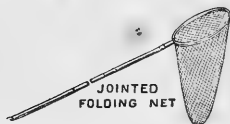
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PSYCHE.

A PRELIMINARY CLASSIFICATION OF THE TRYXALINAE OF THE UNITED STATES AND CANADA.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The Tryxalinae of this country were first made known in tolerable completeness and systematic shape by McNeill in an important paper published a little more than a year ago. His table for the separation and sequence of the genera was, with slight changes (mainly to admit a few types which were rejected by him and to omit one belonging elsewhere) copied by me in my recent Guide to North American Orthoptera, because this latter work was published immediately after the issue of McNeill's Revision; was in fact awaiting its issue. But I there expressed the opinion that the order and alliance of the genera, especially with the changes I had introduced, left much to be desired, and I therefore prepared the subjoined table, which seems to me to place the genera in better order and indicates at the same time some of the larger groups. This arrangement is also in better harmony with the general outline of the classification of the Tryxalinae of the world given by Brunner von Wattenwyl in his *Système* in 1893, which was too little regarded by McNeill. Some of the new genera indicated by Brunner at that

time and unrecognized by McNeill are here included.

The table has been subjected to some use and found to answer tolerably well, though I am not entirely satisfied with it and therefore publish it only as a preliminary attempt, which I hope to improve with time and criticism. It was intended to be accompanied by the addition of descriptions of a number of new forms, but as this part must be deferred under the pressure of other demands, I shall hope to reissue the table in a revised form when the descriptive portion is ready. Meanwhile, in explanation of certain points, I add a few notes referred to by number in the table and given at the close. They relate principally to the new names here introduced and to the synonymy of some of the genera. Except to indicate the types of the new genera, no reference to species is made in this paper.

It is well to remark that our Tryxaline fauna is composed almost entirely of endemic types, only three of its thirty-seven genera being common to the Old World and the New, and these three being boreal types.

TABLE OF THE GENERA OF TRYXALINAE.

*A*¹. Foveolae of the vertex wanting or invisible from above, their plane forming a right or acute angle with the plane of the fastigium; face usually more oblique than in the alternate category:

*b*¹. Sides of the fastigium strongly rounded so that the apex is in no way acuminate; antennae depressed ensiform; tegmina acuminate or angulate at apex; genicular lobes of hind femora (and generally also the genicular angle itself) horizontally produced and acuminate (*Hyalopteriges*).

*c*¹. Fastigium greatly produced, as long as or longer than the eye, its sides on basal half subparallel; face excessively oblique, the eyes sublongitudinal; genicular angle of hind femora longitudinally produced and acuminate.

*d*¹. No foveolae of the vertex; tegmina very much shorter than the abdomen; spines of outer margin of hind tibiae numerous, about 25 in number; subgenital plate of male abdomen excessively elongate. *Rhadinotatum* McNeill (Note 1).

*d*². Foveolae of vertex narrow, elongate; tegmina surpassing the abdomen; spines of outer margin of hind tibiae less numerous, about 16 in number; subgenital plate of male abdomen of moderate length. *Achurum* Saussure.

*c*². Fastigium subtriangular, not greatly produced, distinctly shorter than the eyes, the sides converging from the base; face less oblique, the eyes distinctly oblique; genicular angle of hind femora not longitudinally produced, but roundly deflexed, blunt. *Tryxalis* Fabricius (Note 2).

*b*². Sides of the fastigium straight or gently rounded, so that the fastigium is more or less acuminate; antennae variable; tegmina apically rounded; genicular lobes of hind femora apically rounded, the genicular angle roundly deflexed, blunt.

*c*¹. Hind tibiae armed with numerous spines, numbering 15-20, usually 18-20, on the outer margin (*Mermiriae*).

*d*¹. Antennae long, ensiform; eyes of ♀ somewhat shorter than the infraocular portion of the genae; prosternum with a distinct tubercle; anterior ulnar vein of tegmina situated midway between the radial and posterior ulnar veins, the lower area reticulate in both sexes. *Mermiria* Stål.

*d*². Antennae filiform, apically ampliate in the ♂; eyes longer than the infraocular portion of the genae in both sexes; prosternum with no tubercle; anterior ulnar vein of tegmina nearer the radial than

the posterior ulnar, this lower field regularly fenestrate in the ♂, densely reticulate in the ♀. *Syrbula* Stål.
 c². Hind tibiae armed with less numerous spines, rarely numbering as many as 15, usually only 10-12, on outer margin.

d¹. Radial veins in apical third of wing in ♂ normal, not constricted nor specially incrassate, the discoidal field not fenestrate.

e¹. Head usually more or less conical, ascending, sometimes strongly; eyes usually prominent; upper portion of frontal costa produced so that the front, as seen laterally, is more or less sinuate or excavato-angulate at the ocellus; wings usually banded or highly colored (*Acrolophiti*).

f¹. Head as viewed laterally strongly ascending; face below ocellus subperpendicular; antennae more than half as long as the tegmina; metazona distinctly elevated above the prozona, tumid or crested.

g¹. Metazona much longer than prozona, with an elevated but tumid crest. *Acrolophitus* Thomas.

g². Metazona barely longer than prozona, tumid, but with only a slight carina. *Acrocara* Scudder.

f². Head as viewed laterally with scarcely ascending vertex; face below ocellus distinctly though not greatly oblique; antennae less than half as long as tegmina; metazona not or barely elevated above the prozona, feebly tumid at most.

g¹. Antennae much longer than the face; lower margin of lateral lobes anteriorly excised, broadly exposing the pleura; basal third of tegmina densely reticulate, the intercalary vein obscure.

Pedioscirtetes Thomas.

g². Antennae shorter than the face; lower margin of lateral lobes nearly horizontal throughout, scarcely exposing the pleura; only the extreme base of the tegmina densely reticulate, the intercalary vein distinct. *Gymnes* Scudder.

e². Head obscurely or not conical, never, unless very feebly, ascending; eyes seldom prominent; face, as seen laterally, straight throughout or uniformly rounded, never sinuate or excavato-angulate; wings generally clear or (apically) faintly fuliginous.

*f*¹. Head somewhat ascending; antennae of very unequal length in the two sexes; pronotum with no lateral carinae, the median carinae obsolete on the prozona; scapular area of ♂ tegmina conspicuously expanded, so as to make the costal margin sinuate (*Boottettix*). *Boottettix* Bruner.

*f*². Head generally salient, rarely at all ascending; antennae subequal in the two sexes; scapular area of male tegmina not or but little, rarely at all conspicuously expanded, never considerably disturbing the regular curve of the costal margin.

*g*¹. Antennae distinctly flattened (except in *Amblytropidia*), rather short*; fastigium usually rotundate without distinct lateral costulation or, if distinct, then with a distinct median carina, generally continuing over the occiput, sometimes there accompanied by a pair of submedian carinae; face strongly or rather strongly oblique; lateral carinae of pronotum usually parallel but sometimes converging mesially but without any, or but the faintest, constriction of the body of the pronotum (*Amblytropidia*).

*h*¹. Disk of pronotum more or less clepsydral, the lateral carinae converging near the middle so as to be there nearer together than at either the front or hind margin.

*i*¹. Apical spurs on inner side of hind tibiae very unequal in length.

*j*¹. Antennae apically clavate; lateral carinae of pronotum subparallel; tegmina as long as abdomen.

Eritettix Bruner.

*j*². Antennae apically attenuate though blunt; lateral carinae of pronotum considerable arcuate; tegmina abbreviate.

*k*¹. Hind margin of pronotum angulate or rotundato-angulate; prozona but little longer than metazona.

Mesochloa n. g. (Note 3).

* Not known in *Acentetus*.

h^2 . Hind margin of pronotum truncate; prozona much longer than metazona.

Macneillia n. n. (Note 4).

i^2 . Apical spurs on inner side of hind tibiae subequal. . . . *Acentetus* McNeill.

h^2 . Disk of pronotum equal or subequal, the lateral carinae being strictly parallel or diverging only (and slightly) on the metazona.

i^1 . Scapular area of tegmina in both sexes dilated, subhyaline, regularly areolate with oblique veinlets.

j^1 . Antennae feebly clavate in ♂, depressed but not basally expanded in ♀; supplementary subdorsal carinae on pronotum. . . . *Amphitornus* McNeill.

j^2 . Antennae apically acuminate in ♂, basally expanded so as to be subensiform in ♀; no supplementary carinae on pronotum. *Opeia* McNeill (Note 5).

i^2 . Scapular area of tegmina in both sexes not at all dilated, of the same density as the other areas. . . . *Amblytropidia* Stål.

g^2 . Antennae but little or not flattened, filiform, generally long; fastigium more or less excavate or, if rotundate, with distinct lateral costulation; no median carina on head unless the fastigium is deeply sunken, with high margins; no supplementary carinae; face usually subvertical; lateral carinae of pronotum strongly converging mesially, the pronotum being mesially constricted (*Phlibostromae*).

h^1 . Face strongly oblique; eyes oblique; scapular area of tegmina in both sexes broader apically than basally; prozona much longer than metazona, the latter subtruncate posteriorly.

Alpha Brunner.

h^2 . Face subperpendicular; eyes subvertical; scapular area of tegmina in both sexes broader basally than apically; prozona and metazona of subequal length, the latter angulate posteriorly.

*i*¹. Antennae much longer than head and pronotum together; no median carina on head, except sometimes posteriorly; interspace between eyes as broad as the narrowest part of pronotal disk; longest hind tibial spur scarcely longer than last tarsal joint.

Phlibostroma Scudder (Note 6).

*i*². Antennae no longer than head and pronotum together; a percurrent median carina on head; interspace between eyes hardly if any more than half as broad as narrowest part of pronotal disk; longest hind tibial spur distinctly longer than last tarsal joint.

Psoloessa Scudder.

*d*². Radial veins in apical third of wings of ♂ incassate and constricted, the discoidal field fenestrate (Orphulæ).

*e*¹. Antennae relatively short, at most but little longer than head and pronotum together; fastigium of vertex with no median carina; scapular area of tegmina not specially dilated.

*f*¹. Foveolae of vertex more or less evident; prozona not much longer than metazona; lateral lobes of pronotum transverse, *i. e.*, deeper than long; upper ulnar vein of tegmina, at least in ♂, apically joining the lower ulnar vein at a long distance beyond the end of the basodiscoidal field. *Orphula* Stål.

*f*². Foveolae of vertex wanting; prozona very much longer than metazona; lateral lobes of pronotum longitudinal, longer than or fully as long as deep; upper ulnar vein of tegmina, at least in ♂, apically strongly arched, joining the lower ulnar vein not far beyond the end of the basodiscoidal field.

*g*¹. Lateral lobes of pronotum slightly tumid in descending by the obliquity of the upper portion; lateral carinae divergent on metazona; discoidal field of wings of ♂ distinctly narrowing apically.

Clinocephalus Morse.

*g*². Lateral lobes of pronotum plane, vertical; lateral carinae parallel on metazona as on prozona; dis-

coidal field of wings in ♂ hardly narrowing apically.

Dichromorpha Morse.

*e*². Antennae long, about or more than half as long again as head and pronotum together; fastigium of vertex with a median carina; scapular area of tegmina distinctly dilated in both sexes, but especially in the male. . . *Chloealtis* Harris.

*A*². Foveolae of the vertex always present, visible from above, their plane forming an obtuse angle with the plane of the fastigium; face usually more nearly vertical than in the alternate category.

*b*¹. Tegmina with well-formed intercalary vein.

*c*¹. Inner apical spurs of hind tibiae subequal in length; apical portion of scapular field of ♂ tegmina (and sometimes the adjoining parts) so dilated that the broadest part of the tegmina lies beyond the middle (Stenobothri.)

*d*¹. Antennae filiform.

*e*¹. Face considerably oblique, straight or little rounded; foveolae of vertex slender; lateral lobes of pronotum longer than, or fully as long as deep; interspace between the mesosternal lobes narrower than the lobes themselves.

*f*¹. Fastigium with a distinct median carina; lateral carinae of pronotum subparallel, the disk fully two and a half times as long as posterior breadth; scapular area of ♂ tegmina abruptly and greatly widened beyond the middle.

Napaia McNeill.

*f*². Fastigium with no median carina but only a colored line; lateral carinae of pronotum distinctly though not greatly sinuate, the disk thereby clepsydral and hardly twice as long as posterior breadth; scapular area of ♂ tegmina gradually and less conspicuously widened beyond the middle. . . . *Stenobothrus* Fischer.

*e*². Face little oblique, strongly rounded; foveolae moderately broad, never more than twice as long as broad; lateral lobes of pronotum deeper than long; interspace between mesosternal lobes as broad as the lobes themselves.

*f*¹. Hind margin of pronotum more angulate than front margin; posterior margin of lateral lobes straight; tegmina and wings fully developed.

Platybothrus n. g. (Note 7.)

*f*². Fore and hind margins of pronotum equally (and

slightly) angulate; posterior margin of lateral lobes sinuate; tegmina abbreviate and wings aborted.

Bruneria McNeill (Note 8.)

*d*². Antennae apically clavate. . . . *Gomphocerus* Thunberg.

*c*². Inner apical spurs of hind tibiae very unequal in length, the inferior twice or nearly twice as long as the superior; apical portion of scapular field of ♂ tegmina but little dilated, so that the broadest part of the tegmina lies at the middle (Scyllinae).

*d*¹. Median carina of pronotum as distinct on prozona as on metazona, cut only by the principal sulcus.

*e*¹. Fastigium of the vertex rounded, without or with suppressed lateral costulation; hind tibiae with 14-16 spines on the outer margin. . . . *Boopedon* Thomas.

*c*². Fastigium of the vertex hollowed, with distinct lateral costulation; hind tibiae with 9-12 spines on outer margin.

*f*¹. Eyes elongate, nearly twice as long as broad; frontal costa prominent, advanced in front of eyes by more than half the shorter diameter of the latter; tegmina with definite pantherine pattern. *Plectrotettix* McNeill (Note 9.)

*f*². Eyes suborbicular, much less than half as high again as broad; frontal costa not prominent, advanced in front of eyes by less than half the shorter diameter of latter; tegmina irregularly and obscurely flecked.

*g*¹. Pronotum subtruncate posteriorly, the prozona much longer than the metazona; tegmina and wings abbreviate. . . . *Eupnigodes* McNeill (Note 10.)

*g*². Pronotum more or less angulate posteriorly, the prozona and metazona equal or subequal; tegmina and wings fully developed.

*h*¹. Pronotum constricted in the middle, the prozona slightly the shorter; lateral carinae precurrent, very divergent in front and behind.

Stirapleura Scudder (Note 11.)

*h*². Pronotum not constricted in the middle, the prozona slightly the longer; lateral carinae obsolete on the prozona, moderately divergent behind.

Ageneotettix McNeill (Note 12.)

*d*². Median carina subobsolete posteriorly on the prozona, cut by its sulci, as well as by the principal sulcus. *Aulocara* Scudder (Note 13.)

*b*². Tegmina with distinct intercalary vein (Epacromiæ).

*c*¹. Intercalary vein slender, intermediate between radial and ulnar veins; mediastinal vein of ♂ short, not reaching middle of tegmina, the scapular area beyond it dilated, scalariform-veined; median carina of pronotum obsolescent. *Ligurotettix* McNeill.

*c*². Intercalary vein stout, nearer the ulnar than the radial vein; mediastinal vein of ♂ reaching well beyond the middle of the tegmina, the scapular area beyond it insignificant; median carina of pronotum distinct, sharp. *Mecostethus* Fieber.

Note 1. Rhadinotatum. I correct the spelling of McNeill's name, the initial letter of the Greek word from which he derives it having a rough breathing.

Note 2. Tryxalis. I have given in Psyche, viii, 168, my reason for supporting McNeill in his use of this generic term, instead of *Metaleptea* Brunner.

Note 3. *Mesochloa* (μέσος, χλόα). This new generic name is proposed for *Eritettix abortivus* Brun., readily separable from *Eritettix* by the characters given in the table, and, indeed, nearer to the following genus.

Note 4. *Macneillia*. This name is suggested to replace *Pedeticum* McNeill, preoccupied by *Pedeticus* Laporte in Hemiptera. It is founded on *Chrysochraon obscurus* Scudd.

Note 5. *Opeia*. This name is erroneously spelled *Oreina* in McNeill's key; see his note in Psyche, viii, 71.

Note 6. *Phlibostroma*. The genus named *Beta* by Brunner in his *Système* is the same as this, which has priority. See my note in Can. ent., xxix, 76.

Note 7. *Platybothrus* (πλατύς, βόθρος).

This new genus is founded upon *Stenobothrus brunneus* Thom.

Note 8. *Bruneria*. Given as *Bruneria* (preoccupied) in McNeill's Revision, but corrected by him in Psyche, viii, 71.

Note 9. *Plectrotettix*. Given *Plectrophorus* by McNeill in his Revision, but being preoccupied this name was changed by him to the present form; see Psyche, viii, 71.

Note 10. *Eupnigodes*. For a similar reason and in the same place, this name was substituted for *Pnigodes* of the Revision.

Note 11. *Stirapleura*. As I have pointed out in Can. ent., xxix, 76, *Pseudostauronotus* Brunner is identical with this and of more recent date.

Note 12. *Ageneotettix*. In Psyche viii, 71, McNeill substituted this name for *Eremnus* of his Revision, preoccupied. See also my remarks in Can. ent., xxix, 75, and Psyche viii, 71.

Note 13. *Aulocara*. This is the later *Oedocara* of Scudder and *Coloradella* of Brunner. See my notes in the places last cited.

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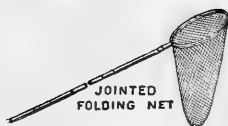
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PSYCHE.

5 A PROBLEM IN DISTRIBUTION.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIFORNIA.

In a systematic* paper on North American Mallophaga, published in 1896, I briefly outlined a "problem in distribution" (pp. 48-57 of the paper referred to) which seemed to me at that time a very suggestive problem, indeed, but which had a slightly uncertain note in its assumption of certain foundation facts. These assumed conditions had, truly, all the seeming of facts, but there failed a possible absolute verification of them. A recent trip to Europe has given me opportunity to examine (by the kindness of Prof. Otto Taschenberg of the University of Halle) a sufficient number of type and authentically determined specimens of European Mallophaga to supply the needed verification of my earlier assumptions, and to discover further new and equally interesting incidents of the problem.

The problem, summarily stated, is this: The species of the Mallophaga (which are wingless, free-living, external parasites on birds and mammals) are, in a majority of cases, peculiar each to some one host species. But the instan-

ces are many in which this condition of distribution does not obtain, but where a single parasite species is common to a few, or to even many, host species. How does this latter condition come to exist?

As the Mallophaga are wingless their power of migration from bird to bird is evidently limited. They run strongly and quickly, but they can live for only a comparatively short time off the body of the warm-blooded host, or on its cold dead body. After a bird is shot the Mallophaga on it die in from two hours to three or four days; in infrequent instances I have found them alive on the drying skin of the host at the end of a week or ten days. Very rarely, indeed, have I found Mallophaga under natural conditions off of the body of the host. Accounts have been given of finding "chicken lice" on the roosts in chicken houses, a quite possible occurrence. But even in such a likely place as an ocean rock from which I had just frightened hundreds of pelicans, comorants and gulls have I looked vainly for Mallophaga which might be wandering from host to host.

* New Mallophaga I (Contributions to Biology from the Hopkins Seaside Laboratory, VI 1896.

Wherever actual contact occurs between the bodies of the hosts, however, migration can and evidently does take place. In this way is the parasite species perpetuated on its normal host species; the parasites can migrate from male to female, and vice versa, during copulation, and from parents to young in the nesting season. But instances of contact among other individuals of the same host species and even among individuals of different host species are not only possible but in the case of certain birds are probably frequent. Wherever such contact occurs no further explanation of the occurrence of single parasite species common to two or more host species is necessary. There is also a possible explanation of possible rare cases of commonness of parasite species to two or more host species whose individuals apparently never come in contact. Sharp* has recorded a case in which a Hippoboscid (winged Dipterous parasite of birds) which was captured while flying "was found to have some Mallophaga attached to it." Such instances must be rare.

It will be of interest now to note the various kinds of cases (for the cases are fairly amenable to classifying) in which a parasite species is common to two or more host species. I have taken *Docophorus lari* from thirteen species of gulls (twelve species of *Larus* and one of *Rissa*), and *Nirmus lineolatus* from nine

species of gulls (all *Larus*). The gulls are gregarious in habit, roosting together in great numbers on ocean rocks. Undoubtedly there is frequent absolute contact of the bodies of individuals of various species, giving opportunity for actual migration. But together with the gulls on the ocean rocks sit other maritime birds; for example, on Scotland's famous Bass Rock *Sula bassana* (a gannet), *Alca troile* (an auk), and *Rissa tridactyla* (a gull) breed socially together (see the striking wall-case of Bass Rock birds in the Natural History Museum, Kensington, London). On the "bird rocks" off Monterey, California, I have found cormorants, pelicans and gulls roosting together, and have found *Lipcurus toxoceras*, a long known parasite of the cormorants, on a pelican (*Pelecanus californicus*), as well as on the cormorants (*Phalacrocorax dilophus albociliatus*). Actual migration of the parasites from the captured prey to the raptorial capturer may evidently take place; I have found a *Physostomum* (genus normally limited to passerine birds) on a sparrow hawk. It is conceivable that among birds with whom hybridization is not infrequent a parasite species may become common to several hosts. Thus the hybridizing which is notorious among allied duck species may help account for the fact that *Docophorus icterodes* is common to many duck species (I have taken it from nine) and that *Trinoton luridum* is similarly common to many hosts (I have taken it also on nine duck species).

* Sharp, D., Proceedings entomological society of London 1890, p. xxx.

But the commonness of a parasite species to several host species occurs in cases where it seems impossible to assume an actual migration. The hawks have two or three parasites, as *Docophorus platystomus*, which are common to several of them; *Docophorus cursor* is common to several owl species, *Docophorus excisus* to several swallows, *Docophorus californiensis* to several woodpeckers, and *Docophorus communis* (with its so-called varieties) to a great many passerine birds. The other genera of Mallophaga present many similar cases. Now in all of the cases mentioned, and it is true of practically all of them unmentioned, it will be noted that the common hosts are closely allied forms, *i. e.*, different species of a single genus, or, and not infrequently, different but allied genera. Only in the case of *Docophorus communis* do we have a parasite's range extending over family limits, the hosts of this form representing several passerine families.

While actual migration in the just-mentioned cases is *almost* an impossible condition, there are other cases to which I shall now refer in which the possibility of actual migration is positively precluded. These cases are those in which a parasite species is common to both American and European hosts of different species and of habits and geographical range which absolutely preclude the possibility of the migration of the parasites from one host species to the other. A few details as to these cases should be of interest. Two hun-

dred and sixty-two* species of Mallophaga have been taken from birds of North America. Of these 262 species, 157 are new species while the remaining 105 species are assumed to be specifically identical with Mallophaga originally described from European (or Asiatic) birds. In a dozen or more cases the American forms are called varieties of the foreign species. The determinations of the American specimens, referred to European species, were based on the descriptions and figures of the European authors Nitzsch, Giebel, Denny, Piaget, Taschenberg, et al. In the case of Piaget and Taschenberg, especially, these descriptions are detailed and excellent, and the figures good. There existed, however, a doubt in these determinations. As already mentioned, I have recently had opportunity to examine many European specimens in the collections of the University of Halle, and to compare with them American specimens taken with me for the purpose of this study. This comparison leaves no question as to the specific identity of American and European specimens taken from different host species. I could not make this comparison for all of the 105 species presumably identical, but could do it for

*The records of the occurrence of these species are included in Professor Osborn's papers, notably his "Insects Affecting Domestic Animals," Bull. no. 5, n.s., Div. of Ent., U. S. Dep't. Agric., 1896, and in my New Mallophaga, I, (1896), New Mallophaga, II, (1896), and New Mallophaga, III, (now printing). A very few records are included in the works of European authors. The number given, 262, is subject to correction, due to a few instances of duplication in Professor Osborn's and my papers.

many of them, and in all of the cases studied the identity is apparent.*

To consider now the problem of how this condition comes to exist we may first refer to and put out of the way the few cases of the common occurrence of a bird species on the two continents, as in the case of imported species (domestic fowl, song-birds, the English Sparrow), or in the case of species of circumpolar range. We may take into account, also, the remote possibility of the meeting on mid-ocean islands of American and European maritime birds of different species. Eliminating these few explicable instances of the commonness of parasite to the two continents, we have left the great bulk of cases to explain in some way which does not presuppose an actual migration from European to American host.

Now it is to be noted that the several host species to which a parasite species is common are almost always closely allied forms, that is, species of the same genus or representatives of two closely allied genera. For examples, *Docophorus pertusus* described by Nitzsch from *Fulica atra*, the European coot, I have taken from *Fulica americana*, the American coot; *Docophorus latifrons* described by Nitzsch from *Cuculus canorus* I have taken from *Coccyzus californicus occidentalis*; *Nirmus fuscomarginatus* found in Europe on Podiceps I have found in America on Colymbus; *Nirmus*

piceus from the European avocet, *Recurvirostra avocetta*, is found in America on the American avocet, *Recurvirostra americana*; *Lipeurus ferox*, recorded from two European species of *Diomedea* I have taken from *Diomedea albatrus* (California); *Lipeurus forficulatus* described by Nitzsch from *Pelecanus onocrotalus* I have taken from *Pelecanus erythrorhynchus* (Kansas) and *P. californicus* (California). And so on through the seventeen or eighteen other genera of Mallophaga. There are a few instances, it must be said, in which the relationship of hosts is not so close, the always conspicuous example of this condition being the occurrence of *Docophorus communis* through several families of passerine birds. But it may be said almost without qualification that where a parasite species found in Europe has also been found in America its American hosts are the American species representing the European genus, or belong to a genus very closely allied to the European one. On this fact I base my belief that the occurrence of a parasite species common to several hosts under circumstances which do not admit of the migration of the parasites from birds to bird is due to the persistence of the parasite species unchanged from the common ancestor of the two or more now distinct but closely allied bird species. With the spreading of the ancestral species, geographical races have arisen within the limits of the species which have with time and with isolation, caused by newly appearing

* Indeed, I have made new species out of one or two American forms which should evidently be referred to already known European species.

geographical barriers due to geologic or climatic changes, come to be distinct species—species often distinguished only by superficial differences in color and markings of plumage, etc. The parasites have remained practically unaffected by the conditions which have produced the differences among the birds; the temperature of the host's body, the feathers as food, all of the environment of the parasite is practically

unchanged. The parasitic species thus remains unchanged, while the ancestral *Larus* or *Anas* species becomes differentiated into a dozen or score of specific forms, all with a common parasite. If this proposed solution of the problem may be accepted, it introduces a factor into problems of distribution, where parasites are concerned, which I do not recall having seen presented before.

NOTES ON NEW ENGLAND ACRIDIIDAE, IV,—ACRIDIINAE, I.

BY ALBERT P. MORSE, WELLESLEY, MASS.

The New England species of Acridiinae or spine-breasted locusts are readily recognized by the presence of a prominent spine or tubercle projecting from the prosternum between the bases of the anterior pair of legs. Sixteen species of this sub-family have been taken in New England; one of these, however, *Schistocerca americana*, being of purely adventitious occurrence. Those that form the fauna proper to the district fall into two groups: two species of *Schistocerca*, and thirteen species of *Melanoplus*. The former genus is at present undergoing revision by Mr. Scudder; the latter group forms the subject of his monumental "Revision of the *Melanopli*" (*Proc. U. S. Nat. Mus.*, vol. xx, pp. 1-421) to which the student is referred for a general discussion of the group, for systematic characters,

and information concerning its extraliminally.

I have adopted here the sequence of genera and species given in that work, preceded by *Schistocerca*, as follows: *Schistocerca* (3 sp.), *Hesperotettix* (1 sp.), *Podisma* (1 sp.), *Melanoplus* (10 sp., in this order,—*atlanis*, *scudderi*, *mancus*, *fasciatus*, *femur-rubrum*, *extremus*, *minor*, *collinus*, *femoratus*, *punctulatus*), and finally, *Paroxya*, (1 sp.). The student dealing with specimens from New England or the northeastern States alone, however, will find a different arrangement of his collection preferable, e. g., the following:—*Schistocerca* (3 sp.), *Paroxya*, *Hesperotettix*, and *Podisma* (each monotypic in New England), and finally *Melanoplus*, in this order: *mancus*, *scudderi*, *atlanis*, *femur-rubrum*, *extremus*, *fasciatus*, *minor*, *collinus*, *punc-*

tulatus, *femoratus*,— or the reverse. The advantage of this arrangement is that it is easy to remember and greatly facilitates comparison of the species most resembling each other, thus, *maneus* and *scudderi*, *atlanis* and *femur-rubrum*, etc.

The terminology of species is that of Scudder's Revision. The other works referred to are either general treatises or those dealing especially with New England locusts, familiar to the student of Orthoptera and listed in previous parts of these Notes. Two articles by Mr. Scudder of especial interest in this connection will be found in *Psyche*, (1896), p. 367, and the *Proc. Boston Soc. Nat. Hist.*, XIX, p. 284, the former containing a key to the Melanopli which may be of assistance to the student. Certain features of this I have embodied in my own, which, however, like those in previous parts of these notes, is constructed with especial reference to the needs of the novice in determining specimens, artificial characters being frequently used instead of systematic, which are often appreciable only after long study of a group. Our species will all be readily recognized with the exception of the females of certain species of *Melanoplus*. These are, without exception, the most difficult to discriminate of all our locusts, owing to the variability of every available character, — width of interspace, form of prosternal spine, valves of ovipositor, cerci, markings, etc.

The present group is much less attractively colored than the *Oedipodinae* though in the living state several of the species are decidedly handsome. While the prevailing color of most of the species of *Melanoplus* is dull olivaceous, a striking variation occurs in *femur-rubrum*, *atlanis*, and *minor*, individuals of both sexes being occasionally found which have the face, top of head and pronotum bright rose-red. Other color-variations are noted in connection with the various species. There is in most species of *Melanoplus* considerable variation in color locally, according to the character of the station where found, and also seasonally, whether collected early or late in the fall. As a rule specimens collected after a number of hard frosts are duller, darker and more suffused than summer examples, the coloration of the individual being apparently considerably modified by such exposure.

In the preparation of this article I have examined over 3000 New England specimens collected chiefly in person and now in my collection, each species being represented, save in two instances, by a large series of specimens. In addition, I have examined for special points, a considerable number belonging to Mr. Scudder, to whom I am indebted for favors in a variety of ways, and whose publications I have freely used; with the result of greatly lightening my labors.

SIX NEW OR LITTLE KNOWN LARVAE OF PTEROPHORIDAE.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Trichoptilus lobidactylus Fitch. — Head faintly brownish, retracted at the apex under joint 2; width .7 mm. Body shining green, semi-transparent; no marks; tracheal line faintly showing by transparency, dorsal vessel darker. Warts rather few haired, i and ii united into a single wart, iii small, a single hair above and behind spiracle (iia) iv and v united, vi and vii small; a few short secondary hairs subventrally; all the hairs glandular and gummy, swollen at the tips even without a lens and often with drops along the shaft. The hairs are sordid white, sparse, and rise 1 mm. above the dorsum. A row of minute, impressed, black dorsal dots on joints 5 to 11. At the bases of the several hairs are brown rings, causing the warts to appear slightly discolored. In ♂ larvae the sex-glands appear in joint 9, yellowish, not pronounced.

Pupa. Attached by the cremaster; without winged elevations; green, vinous patch on segments 4-5 of abdomen. Head roughened with coarse tubercles, vinous brown; thorax obliquely truncate anteriorly, rounded; hairs shorter and fewer than in the larva, scarcely glandular. Length 8 mm.

On smooth leaved golden-rod (*Solidago*), Van Cortlandt Park, New York City, May.

Oxyptilus tenuidactylus Fitch. — Head green, .7 mm. wide. Body pale green, with a faint sub-dorsal white band. Warts i and ii united, bearing about ten setae with simple ends; iii with six setae; a small wart behind it with two setae (iia); iv + v with two large setae and several small ones; a single seta behind this (iii b); vi with a distinct tubercle, but somewhat confused among the secondary hairs; vii of three large setae with several shorter ones; secondary hairs scat-

tered over the body, and these as well as some shorter ones from the warts, have swollen or cleft tips.

Pupa. Slender, tapering behind, fastened by the cremaster. A row of sub-dorsal tubercles bearing four spines in a fan-like arrangement, continued as a carinated ridge on the thorax. Thorax widened, the cases produced into a point along the abdomen. Two slight points above the eyes. Whitish green, cases more greenish. There are several spines on the thorax, and some fine, soft hairs on abdomen laterally. Another pupa was light purplish brown.

On the buds of blackberry (*Rubus*), Keene Valley, N. Y., June. Found with *Butalis basilaris* Zell., but more closely resembles the blackberry buds than this Tineid does.

Pterophorus rhyncosiae n. sp. — Expanse 18 mm. Head and thorax yellowish gray; abdomen neatly lined with brown; a medio-dorsal and six lines on each side; above, the first and third segments are tufted with white posteriorly; legs pale yellow, white towards the tips, narrowly lined with brown longitudinally. Fore-wings yellow-gray; a small double black dot at base of fissure, and one half way between this and base; a minute dot towards apex of first lobe. Fringe pale, the outer third on first lobe black; terminal part of fringe of second lobe blackish, basal part pale, cut by five black wisps; the fifth at apex. Hind wings blackish, a black dot at apex of each lobe; base of fringe of third feather whitish, contrasting.

Larva. Downy, pale green, with short white hairs. Pale green, the body tapering a little posteriorly; no marks except a very faint, whitish subdorsal line along warts i and ii; warts small, i and ii separate, but somewhat approximate; a small wart (iia)

below and behind iii; iv + v distinct with a small wart (iiib) behind; skin densely covered with very short, white, club-tipped secondary hairs. Feet short.

On the young leaves of a trailing plant (*Rhynchosia*) at Miami, Fla. December.

Pterophorus elliotii Fernald.—The moths both in color and the structure of the genitalia correspond with Prof. Fernald's species rather than with *P. homodactylus* Wlk; yet I doubt the specific distinctness of these forms. It is easy to understand the occurrence of two "plume" larvae on *Eupatorium*, as they have different habits; but there scarcely seems room for a third one. Kellicott's description of *homodactylus* fits *elliotii*.

Larva. Head pale, eye black; width 1.9 mm. Body green, subdorsal and stigmatal bands slender, whitish shades, the former along warts i and ii; a waved lateral line, bent down behind tubercle iii and a narrow dorsal line. Hair long, white, rather abundant. No secondary hairs. Tubercles i and ii are distinct, but contiguous, in line; a single hair (iiia) behind and below iii; a small wart of two hairs (iiib) behind iv + v; vi and vii several haired. Skin with sparse, minute, clear granules. In the ♂ the dorsum of joint 9 is all diffusely yellowish.

Pupa. Fastened by cremaster, much resembling the larva in appearance. Green with the same marks as the larva; the ♂ sex-glands visible. The cases reach to the middle of fourth abdominal segment, the leg cases to the seventh. The hairs are roughly arranged as in the larva, but the warts are diffuse, scattered, and there is a median dorsal hair; the hairs are also shorter.

Exposed feeders on the young leaves of *Eupatorium* at Van Cortlandt Park, New York City. May.

Pterophorus eupatorii Fernald.—Closely allied to the preceding, the warts arranged the same. Color the same, till the last stage when the dorsum becomes all suffused with reddish. The hairs are shorter than in *P. elliotii* and the dorsal ones are blackish in-

stead of white. There is a pale line along warts iv + v. Hairs pointed, slightly barbed.

The larvae live on the under sides of the leaves which they bend together with webby silk.

On *Epilobium*, Van Cortlandt Park, New York City.

Pterophorus cretidactylus Fitch.—Head rounded, higher than wide, partly retracted; green, ocelli black. Body a little thicker in the middle, uniform green with a whitish dorsal line. Warts round, concolorous, i and ii near each other but separate, a small wart (iii a) below and behind iii; another (iii b) behind iv + v, vi and vii not large. Feet normal, the abdominal ones slender, wider at the claspers.

Pupa suspended by the cremaster, slender; cases projecting over the abdomen half way to the tip. Uniformly green, covered with tufts of sparse radiating hairs, arranged roughly as in the larvae. Length 11 mm., width 2.5 mm. On aster*, Yosemite, Cal. June.

Synopsis of larvae here described.

Warts i and ii united; secondary hairs present.

Hairs sticky glandular; on *Solidago*

T. lobidactylus

Hairs not sticky; on *Rubus*

O. tenuidactylus

Warts i and ii separate.

Secondary hairs present; on *Rhynchosia*

P. rhynchosiae

No secondary hairs.

A waved subdorsal line below wart ii; on *Eupatorium*.

Hair long (3-3.5 mm.) exposed feeding

P. elliotii

Hair short (1.6-1.8 mm.) concealed feeding

P. eupatorii

No waved subdorsal line; on aster

P. cretidactylus

* This plant was not determined with certainty.

THYNNIDAE IN THE UNITED STATES.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

IN Ent. News, Vol. III, p. 104 (1892), the following brief notice by Mr. Wm. H. Patton occurs: "Thynnus in California. This genus has not hitherto been found north of the equator in either hemisphere, nor has any of the family Thynnidae. A single specimen received from Dr. F. E. Blaisdell, from Poway, San Diego County, Cal., is the first intimation of its occurrence in North America. It is a small black species with hyaline wings and may be named *Thynnus californicus*."

The author has not since published a description of this interesting insect and the above laconic description is too insufficient for me to tell whether or not it is at all related to the two Thynnids, described below, also from California.

Telephoromyia anthracina n. sp.—♂. Length 13-14 mm. Black, shining but punctate, and clothed with black hairs, the hairs greyish on scape, the clypeus anteriorly and the anterior femora beneath. Clypeus, a small triangular spot above between the antennae, and the inner orbits to above the middle of eyes yellow or yellowish white. Wings violaceous black, paler or hyaline at basal one-third. Mandibles tridentate, the outer tooth the longest, acute. Mesonotum with four more or less distinct longitudinal grooved lines. Claws with a tooth at the middle.

Hab.—Los Angeles, California.

Type—No. 5053, U. S. N. M.

Described from two specimens collected by Mr. D. W. Coquillett.

The genus *Telephoromyia* is peculiar to South America.

GLYPTOMETOPA n. g.

Body smooth, polished, unspiculate, clothed with very sparse, long yellowish-white hairs. Head viewed from above quadrate, a little wider than long, with a long curved sulcus on each temple above the eye,

the sulcus fringed with long hairs. Ocelli wanting. Mandibles bidentate. Eyes not large, oval, placed at the anterior angles of the head and almost touching the base of the mandibles. Maxillary palpi 6-, labial palpi 4-jointed. Antennae 12-jointed, short; the scape dilated, with a tuft of bristles above, and as long as the pedicel and the first two joints of flagellum united; the flagellum is about as long as the head is wide; pedicel shorter than the first flagellar joint, the latter being shorter and slenderer than the following joints; the last joint the longest, as long as the pedicel and the first joint of flagellum united. Thorax about $2\frac{1}{2}$ times as long as wide, divided into three parts, the pronotum quadrate, the anterior angles a little rounded, and as long as the metathorax; mesonotum transverse, entire, about half as long as the metathorax, the scutellum not differentiated; metathorax viewed from above trapezoidal, the posterior face and sides perpendicularly truncate. Legs fossorial, the middle and hind legs armed with short spines on anterior face, with longer spines at apex; tibial spurs 1, 2, 2; tarsi long, each pair gradually increasing in length, the hind pair being the longest, the joints armed with spines; claws simple. Abdomen subsessile, long, subcylindrical, much longer than the head and thorax united, six segmented, the second segment the longest, wholly smooth and polished, and clothed with long, sparse hairs.

Glyptometopa americana n. sp.—♀. Length 4.5 mm. Uniformly ferruginous, sparsely clothed with rather long, glittering white hairs; eyes black; middle and hind tibiae armed with numerous short, stiff spines, those on hind tibiae less distinct and sparser, the anterior tibiae smooth.

Hab.—Alameda County, Cal.

Type—No. 5052, U. S. N. M.

Described from a single specimen taken in September, by Albert Koebele.

A NEW HEMILEUCA.

Hemileuca sororia, race *oliviae*, n. race.

♂. Expanse of wings 52 mm. Upper part of head and thorax densely covered with pale yellowish gray hair; abdomen above entirely covered with bright crimson hair. Under side of abdomen with yellowish white hair, except apex, where it is ferruginous. Face with pinkish ferruginous hair. Legs with appressed bright ferruginous hair in front, and long dirty white hair behind, except on tarsi. Antennae very bright ferruginous. Primaries above very pale ochreous, with an indistinct discal spot, slightly outlined in orange, situated on a broad transverse band of a deeper shade than the rest of the wing. No dark marks of any sort. Secondaries of the same shade, but still paler, with the nervures more or less pale orange. Beneath, the secondaries are as above, but the primaries have an orange costa and orange nervures, and a rosy subcostal shade.

Hab.—Santa Fé, N. M., 7000 ft., autumn of 1897. Type in U. S. Natl. Museum. This beautiful moth is closely allied to *H. sororia* Hy. Edw., from La Paz, Lower California, and *H. hualapai* Neum., from S. W. Arizona, both known as yet only in the ♀. Dr. H. G. Dyar is of the opinion that all three belong to one species; but since *oliviae* comes from a different life-zone from the others, and differs from them in many particulars, it seems best to regard it as a distinct race, at least, until the contrary is proven.

I will take this opportunity of referring to a *Scepsis* which I took last year at Albuquerque, N. M., September 16, on a purple aster. Dr. Dyar identifies it as *S. fulvicollis* Hbn. The collar is quite red, not pale as in the race *pallens* Hy. Edw., which is supposed to occupy the Rocky Mountain region to the exclusion of the type.

T. D. A. Cockerell.

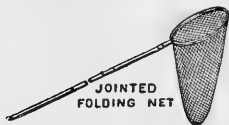
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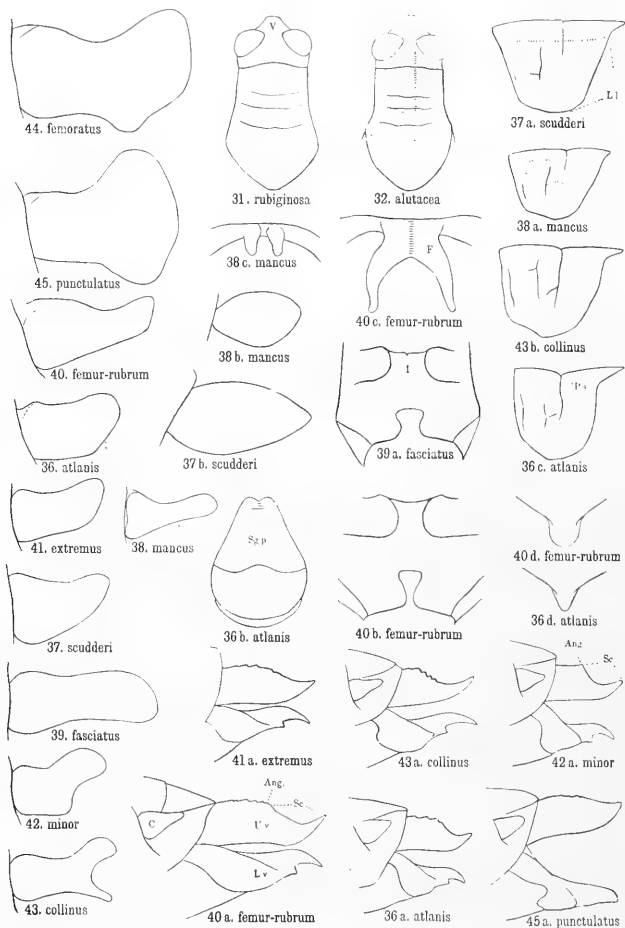
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EXPLANATION OF PLATE 7.

(Species 33, 34, 35 and 46 are not figured.)

31. *Schistocerca rubiginosa* ♂. Head and pronotum from above.
 32. " *alutacea* ♂. " " " " "
 36. *Melanoplus atlantis* ♂. Cercus.
 36a. " " ♀. Ovipositor.
 36b. " " ♂. End of abdomen from rear.
 36c. " " ♀. Pronotum from side.
 36d. " " ♀. Prosternal spine from front.
 37. " *scudderi* ♂. Cercus.
 37a. " " ♀. Pronotum from side.
 37b. " " ♀. Tegmen of left side.
 38. " *maneus* ♂. Cercus.
 38a. " " ♀. Pronotum from side.
 38b. " " ♀. Tegmen of left side.
 38c. " " ♂. Furcula from above.
 39. " *fasciatus* ♂. Cercus.
 39a. " " ♀. Meso- and metasterna; interspace transverse.
 40. " *femur-rubrum* ♂. Cercus.
 40a. " " ♀. Ovipositor.
 40b. " " ♀. Meso- and metasterna; interspace longitudinal.
 40c. " " ♂. Furcula from above.
 40d. " " ♀. Prosternal spine from front.
 41. " *extremus* ♂. Cercus.
 41a. " " ♀. Ovipositor.
 42. " *minor* ♂. Cercus.
 42a. " " ♀. Ovipositor.
 43. " *collinus* ♂. Cercus.
 43a. " " ♀. Ovipositor.
 43b. " " ♀. Pronotum from side.
 44. " *femoratus* ♂. Cercus.
 45. " *punctulatus* ♂. Cercus.
 45a. " " ♀. Ovipositor.

Ang. = angulation at base of scoop of ovipositor, — 40a, 42a.

C. = cercus of female, — 40a.

F. = furcula, — 40c.

I. = interspace between mesosternal lobes, — 39a.

L. l. = lateral lobe of pronotum, — 37a.

L. v. = lower valve of ovipositor, — 40a.

P. s. = principal sulcus, — 36c.

Sc. = scoop of ovipositor, — 40a, 42a.

Sg. p. = subgenital plate of male, — 36b.

U. v. = upper valve of ovipositor, — 40a.

V. = vertex of head, — 31.

PSYCHE.

NOTES ON NEW ENGLAND ACRIDIIDAE, IV.—ACRIDIINAE.—II.

BY ALBERT P. MORSE, WELLESLEY, MASS.

KEY.

- A. Without trace of tegmina or wings; dark olive-green above, length one inch or a little less; on higher mountains. *PODISMA*.
B. Cerci of male relatively stout, the middle distinctly more than half as broad as the base. Sp. 35, *P. glacialis*.
[BB. Cerci of male slender, the middle less than half as broad as the base. *P. variegata*. *]
- AA. Tegmina present.
C. Size large, length of tegmina 27 mm. or more. *SCHISTOCERCA*.
D. Very large, tegmina 42 (♂) to 55 (♀) mm. long. Body and tegmina brown, conspicuously varied with ashy and yellow stripes and fuscous spots, with a pale mid-dorsal line on head, pronotum, and closed tegmina. Sp. 33, *S. americana*.
DD. Smaller, length of tegmina 27 (♂) to 40 (♀) mm.
E. With a distinct, pale yellow mid-dorsal stripe on head, pronotum and closed tegmina. General color varying from rusty brown through yellowish to olive-green. Vertex more prominent (Fig. 32). Sp. 32, *S. alutacea*.
EE. Without such stripe, only the dorsal edge of closed tegmina sometimes yellowish. General color rusty brown. Vertex less prominent (Fig. 31). Sp. 31, *S. rubiginosa*.
- CC. Size medium or small, tegmina not over 23 mm. long.
F. Pronotum deeper than broad. Hind tibiae greenish blue. General color when fresh (sometimes becoming very dark when dry) a bright pale green, with a conspicuous narrow purplish mid-dorsal line on pronotum, usually on head also, and with the dorsal part of closed tegmina usually largely purple. Antennae pink, short, of female

*Not known from New England, but found near Ithaca, N. Y. See Scudder, — Rev. Melanopli, p. 101, pl. vii, fig. 4.

less than head plus pronotum, of male a little longer proportionally. Small, 16 to 24 mm. Cerci of male straight, tapering evenly to a sharp, conical point. . . . Sp. 34, *Hesperotettix brevipennis*.

FF. Not as above: coloration usually dull, chiefly brownish or olivaceous, the tegmina invariably so.

G. Hind tibiae bright greenish blue. Hind femora not transversely banded, slender, of male about 12 mm., of female about 16 mm. long. Tegmina fully developed, at least double the length of the pronotum, not spotted or streaked. Body slender, eyes noticeably prominent. Antennae very long, of male twice, of female distinctly more than once, as long as head plus pronotum. Mid-carina of pronotum distinct, equally developed throughout. Prosternal spine long, tapering, sharply pointed. Cerci of male nearly symmetrical, slender, the tips a little expanded, and incurved, caliper-like. Sp. 46, *Paroxya floridana*.

GG. Not as above. MELANOPLUS.

KEY TO SPECIES OF MELANOPLUS — Males.

1. Tegmina no longer or scarcely longer than pronotum.*
 2. Cerci slender, clasp-like, four times as long as their middle breadth (Fig. 38). Furcula well-developed but short (Fig. 38c). Mid-carina of pronotum indistinct on prozona *M. mancus*.
 - 2'. Cerci broad, sub-triangular, less than three times as long as the middle breadth (Fig. 37). Furcula usually very short. Mid-carina of pronotum distinct throughout *M. scudderi*.
- 1'. Tegmina much longer than pronotum.
 3. Subgenital plate with apical margin conspicuously notched (Fig. 36b). Tegmina equalling or passing the hind femora. Cerci subtrapezoidal, about twice as long as broad (Fig. 36). *M. atlantis*.
 - 3'. Subgenital plate not conspicuously notched.
 4. Cerci distinctly forked, the lower branch narrower (Fig. 43). *M. collinus*.
 - 4' (4''). Cerci of irregular shape or very unequal width.
 5. Cerci with apical two-fifths suddenly narrowed on ventral side to nearly one-half the width of basal three-fifths (Fig. 42). *M. minor*.
 - 5'. Cerci broadly expanded apically.

* *Mel. islandicus* Blatch. (Psyche, April 1898, p. 196 = *M. abortivus* E. M. Walker, Can. Ent., April 1898, p. 90), found in the vicinity of Toronto, Canada, resembles *mancus*, especially the female. The male may be readily separated from *mancus* by the cerci which are shorter, but little longer than their width at base, with sides tapering evenly to a flattened, very slightly expanded tip. This species may possibly occur in the St. Lawrence basin within our boundaries.

6. Cerci roughly sock-shaped by an expansion on the dorsal margin of apex (Fig. 44). Hind femora robust, not transversely banded with dusky. Interspace between mesosternal lobes nearly twice as long as broad. A large, robust species, with unspotted tegmina. *M. femoratus*.
- 6'. Cerci terminating in a transverse, oval, tumid lobe (Fig. 45). Hind femora slender, transversely banded. Interspace subquadrate. Tegmina more or less distinctly spotted. A species of medium size. *M. punctulatus*.
- 4". Cerci simple in outline, nearly straight.
7. Furcula very short.
8. Cerci nearly straight, three or four times as long as their middle breadth and sub-equal in width throughout (Fig. 39).
M. fasciatus.
- 8'. Cerci less than three times as long as their middle breadth, tapering, slightly curved dorsad (Fig. 37). *M. scudderi*.
- 7'. Furcula long, much longer than last dorsal segment, from which it arises (Fig. 40 c).
9. Cerci tapering, the distal half less than half as broad as the extreme base (Fig. 40) *M. femur-rubrum*.
- 9'. Cerci with the distal half distinctly more than half as broad as the extreme base (Fig. 41). *M. extremus*.

KEY TO SPECIES OF MELANOPLUS.—Females.*

1. Tegmina no longer or scarcely longer than pronotum (See note on p. 256).
2. Interspace between mesosternal lobes usually distinctly transverse. (Fig. 39a). Mid-carina of pronotum usually obsolete or rudimentary on pronotum. Lateral lobes of pronotum noticeably longitudinal, the ventral half very pale in color, contrasting strongly with the dorsal half (Fig. 38a). Tegmina shorter than pronotum, sub-oval (Fig. 38b). A conspicuous oblique pale streak on the metepisternum. *M. mancus*.
- 2'. Interspace quadrate. Mid-carina of pronotum conspicuous, about equally

* In using this table it should be distinctly understood that implicit reliance cannot be placed on any single character, so great is the similarity between species and so wide the range of individual variation. In many cases all available characters need to be considered in order to determine with certainty the species to which a given specimen belongs. In addition to the points stated in the table, the measurements, locality, and date may be found helpful. From 90 to 95 % of the specimens examined will be readily determined by this table, most of the remainder with a little trouble, and about 2 or 3 % not until the student has become thoroughly familiar with all of the species here considered. *Femoratus* will be at once recognized by its size; *punctulatus* by the form of the ovipositor; *minor*, less readily, by the same means; *mancus* and *scudderi* by the tegmina; but the other five will be more difficult.

- developed throughout. Lateral lobes nearly as deep as long, the dorsal and ventral halves not strongly contrasted in color. Tegmina sublanceolate, tapering toward apex, about twice as long as wide (Fig. 37b). Metepisternum lacking distinct pale streak. *M. scudideri*.
- 1'. Tegmina much longer than pronotum.
3. Large, robust; hind femora 16 mm. or over (usually 18-19). Dorsal area of closed tegmina separated from lateral area by a pale streak which sometimes suffuses entire dorsal area. *M. femoratus*.
- 3'. Smaller; hind femora not over 14 mm.
4. Lower valves of ovipositor about straight, the lateral tooth nearly or quite obsolete (Fig. 45a). Interspace between mesosternal lobes transverse. Tegmina maculate with dusky. Hind femora conspicuously banded on outside and cherry-red within at base. *M. punctulatus*.
- 4'. Lower valves of ovipositor with the apex more or less distinctly decurved, and with a distinct lateral tooth midway of the lower outer margin (Figs. 36a, 40a, etc.).
5. Interspace between mesosternal lobes longitudinal or quadrate. Species with tegmina usually passing the hind femora, the body relatively slender, the pronotum when seen from side often depressed at the principal sulcus, with smaller, uninflated prozona (Fig. 36c).
6. Tegmina more or less flecked with dusky and pale spots along the middle. Hind femora usually showing more or less distinct fuscous bands, at least on the dorsal side. Upper valves of ovipositor angulated at base of scoop (Figs. 42a, 40a, etc.).
7. Prosternal spine nearly cylindrical, the tip bluntly rounded, often bulbous (Fig. 40d). Cerci once and a half or twice as long as wide, sharply pointed, somewhat acuminate, the sides slightly concave (Fig. 40a). Ovipositor seen from side with the basal part of scoop longer, the angle between scoop and stem more obtuse. Hind tibiae red. Hind femora largely or wholly lacking transverse dusky bands except on dorsal part of inner face. Mid-carina of pronotum frequently distinct on prozona. *M. femur-rubrum*.
- 7'. Prosternal spine tapering, the tip pointed (Fig. 36d). Cerci shorter, only about one and one-third times as long as wide, rather dull at tip, the sides straight or

- often convex (Fig. 36a). Upper valves of ovipositor with scoop shorter, the angle at junction with stem more pronounced (Fig. 36a). Hind tibiae either glaucous or red. Hind femora usually with conspicuous dusky oblique bands. Mid-carina of pronotum seldom distinct on prozona. . . . *M. atlantis*.
- 6'. Tegmina and hind femora immaculate or showing only faint traces of spots or bands. No angulation at junction of scoop and stem of ovipositor (Fig. 41a). Prozona fuller proportionally, the dorsal line of pronotum horizontal. Interspace usually sub-quadrate or transverse. *M. extremus*.
- 5'. Interspace between mesosternal lobes sub-quadrate or distinctly transverse. Species with relatively stout body, swollen prozona (giving a thick-necked appearance, Fig. 43b), and tegmina not passing hind femora.
8. Tegmina about reaching end of hind femora. Interspace but little transverse.
9. Scoop of ovipositor very short, deeply concave, with a single or no denticulation at base of outer edge; lower valves with the tips correspondingly short and decurved (Fig. 42a). Hind tibiae usually glaucous but often red. Tegmina flecked with dusky and pale spots, hind femora obliquely banded. Lateral carinae of pronotum usually bordered below on the prozona by a broad fuscous stripe which is crossed obliquely by a distinct, narrow, pale line. Prozona less inflated than in *collinus* and body less robust. . . . *M. minor*.
- 9'. Scoop rather long, the outer edge of basal half crenulato-denticulate, the tips of both pairs of valves long and evenly tapering (Fig. 43a). Hind tibiae coral red. Fuscous stripes on prozona indistinct, often lacking. Tegmina maculate and hind femora obliquely banded. A robust species with noticeably tumid prozona and thick-necked aspect (Fig. 43b). . . . *M. collinus*.
- 8'. Tegmina reaching but one-half or two-thirds the length of the hind femora. Interspace rather strongly transverse.
10. Hind femora with conspicuous oblique dusky bands, at least above. Hind tibiae red. Tegmina usually dark brown, flecked with dusky and pale spots. A

robust species with interspace strongly transverse (Fig. 39a). Prosternal spine variable, rather short. Ovipositor similar to that of *extremus* or a little stouter.

M. fasciatus.

- 10'. Hind femora not obliquely banded, rarely with traces of dusky on dorsal part of inner face. Hind tibiae variable. Tegmina brownish olive, immaculate or very nearly so. General color varying from greenish to brownish olive, with black markings. Interspace varying from sub-quadrate to rather strongly transverse. Tegmina variable in length, sometimes passing hind femora. Prosternal spine variable, most resembling that of *femur-rubrum*. Scoop of ovipositor in side view without angulation at junction with stem (Fig. 41a). *M. extremus.*

ON SOME NEW AND ANOMALOUS TETTIGONINAE.

BY C. F. BAKER, AUBURN, ALA.

The following new species belong to genera not before recorded from America. They occupy as anomalous a position among the Tettigoninae, as does *Tinobregmus* among the Jassinae. Like *Tinobregmus*, they present a remarkable difference in the two sexes, and are heavily robust in form. All four species belong to the far west, the eastern limit being Colorado.

The ocelli are not as near the front margin of the vertex as in some other unquestioned Tettigonids. Compared with *Acocephalus*, the eyes are distant from the front edge of vertex, and occupy a position never approached by the ocelli in *Acocephalus*. Besides, other details of structure show a closer

relationship with the Tettigonine series, where I have placed them. The single species of *Bathysmatophorus*, *reuteri*, was described from the Scandinavian countries. *Errhomenus*, with its single species, *brachypterus*, is quite widely distributed in Central Europe.

***Bathysmatophorus uhleri* n. sp.** Length of ♀ 9.5 min. Color pale brownish, irrorate with darker, minutely so on head and pronotum, coarsely on dorsum and fore femora.

Vertex about a half longer on middle than next eyes, rather strongly depressed; ocelli about midway of its length, and somewhat nearer the median line than to eyes. The front subrectangular in general outline, a little broader above, somewhat timidly extended, and crossed by numerous faint dark arcs. Clypeus regularly oblong, nearly two-

thirds the length of the front and distinctly exceeding the genae. Genae very strongly incurved below the eyes, making the latter unusually protuberant. Pronotum little longer than vertex, faintly transversely aciculate and with several shallow transverse creases or constrictions. Elytra trapezoidal in outline, reaching the middle of last dorsal segment; color sordid whitish with numerous fine irregular irrorations, which are more distinct on veins. Fore and middle femora with numerous small white spines. All tibiae more or less marked with dark.

Last ventral segment a half longer than preceding and with it having a slight median keel; hind margin truncate with a median notch reaching half the length of the segment. Ovipositor nearly one-third the length of the body and exceeding the pygofer by nearly 1 mm.

Length of ♂ 6 to 8 mm. Much darker than the female, the sternum and most of venter black. In some specimens the upper part of face is shining black. The vertex is shorter and the pronotum less strongly arcuated behind. The elytra exceed the abdomen by .5 to .75 mm. The plates are long, slender, acutely curved upwards distally, and supplied at base with a slight transverse callosity. The valve is short and very obtusely angulate. The last ventral segment is broadly roundly extended backwards at middle.

Described from one female and several males in the National Museum, collected at Los Angeles, Cal., by Mr. Coquillett and at Dunsmuir, Cal., by Mr. Wickham. These specimens bore the Mss. name *Lystriidea conspersa* Uhl. *Ultheri* seems to be entirely congeneric with *reuteri*.

Erythromenus lineatus n. sp. Length of ♀ 7 mm. Color pale yellowish brown. Head slightly wider than pronotum. Vertex

bluntly angulate, nearly twice longer at middle than at eyes, once and a half the length of pronotum; numerous indistinct brownish transverse arcs on front; two black dots near hind margin of disc of vertex. Ocelli at about half length of vertex and equidistant from median line and anterior margin of vertex. Clypeus broad at base, rapidly narrowing to the oval tip which projects beyond the genae. Pronotum short, the width twice and three fourths the length, fore and hind margin nearly parallel, the latter broadly angularly emarginate; laterally distinctly carinate; disc with a transverse row of about six black dots; anterior margin with a conspicuous though not large black spot behind each eye. Elytra obliquely truncate behind, not equalling second abdominal segment, sordid whitish in color, the discs of cells darker. Dorsum with a double median longitudinal row of black dots, each segment with about two transverse rows of minute black points; the spiracles in black dots. Sternum more or less black laterally.

Last ventral segment twice length of preceding, the hind margin truncate, with a very shallow median notch. Ovipositor slightly exceeding pygofer.

Length of ♂ 5.5-6 mm. Far darker and more heavily marked than the female. Vertex shorter than pronotum and more strongly irregularly concave. A more or less well-defined dark median line extending from point of vertex to scutel. All below except legs largely black, sparingly irregularly irrorate with yellowish; a conspicuous yellowish band extending from beneath antennal pit back upon the propluræ. Femora lineate with dark. Dorsum black with a few whitish points. Elytra exceeding abdomen by about one mm., sordid white with irregular dark cloudings in the cells. Wings transparent, slightly smoky apically.

Valve black, scarcely exerted, remainder of genitals more or less sordid whitish.

Plates long, slender, parallel sided below, becoming acute apically and curving upward.

Described from two females and five males taken at Pullman, Wash., by Prof. C. V. Piper.

Evrhomenus montanus n. sp. Length of ♀ 6.5-7 mm., of ♂ 5.25-6 mm. Very close to *lineatus*. The last ventral segment of female is distinctly produced medially within the protruding lateral angles; the apex with a small median notch. The plates of the male are not as acute or strongly bent upwards as in *lineatus*. The elytra of the male exceed the abdomen but little, and lack any noticeable contrast of colors.

Described from three females and four males collected by myself in northern Colorado. They occurred in the foot-hills west of Fort Collins in May, and at Cameron Pass from 10000 feet to above timber, during July. I was at first inclined to place this with *lineatus* as a variety, but would at present be scarcely justified in so doing. Series from points between Washington and the mountains of Colorado are needed to decide the question.

Evrhomenus oregonensis n. sp. Length

of ♀ 7 mm. Closely resembling a fully colored example of *montanus*. The vertex is proportionally shorter and more blunt. The front is more tumid and as viewed from the side not evenly curved upon the clypeus. The anterior legs are unusually pale. The head is about as broad as pronotum. The elytra are broadly rounded behind instead of being obliquely truncate, and they slightly exceed the second segment.

Length ♂, 5-5.5 mm. The male has abbreviated elytra which reach only the penultimate dorsal segment. The colors, sordid white to black, are more sharply contrasted than in the other species, though similarly disposed. The transverse row of black spots on the pronotum is very sharply defined, though the darker longitudinal band is wanting. The abbreviated elytra flare slightly, giving the male a shortened, robust appearance which is very suggestive of *Tinobregmus*.

Described from one female taken at Corvallis, Oregon, by Prof. A. B. Cordley, and several specimens in the National Museum collected in Oregon by Mr. Koebele. The shortened elytra of the male brings a new element into the genus, but the relationships of the female with *lineatus* and *montanus* are unquestionable.

THE COCCID GENUS SOLENOPHORA IN THE UNITED STATES.

BY T. D. A. COCKERELL, N. M. AGR. EXP. STA.

The genus *Solenophora* Maskell, is represented by two species confined to New Zealand, so far as published information goes. Mr. Maskell has been kind enough to send me specimens of both these species; to them I have just added a third, collected by Mr. Koebele in Mexico, and transmitted to me

by Dr. Howard. To thus receive a supposed endemic New Zealand genus from Mexico was indeed surprising; but to-day, before the report on the Mexican material has appeared in print, there comes to hand yet another species, from Colorado!

Solenophora coloradensis, n. sp. ♀. Scale

oval, $2\frac{1}{2}$ mm. long, $1\frac{1}{2}$ broad, about 1 high; ochre yellow, more or less bright lemon yellow at the sides, very rough and irregularly nodulose; dorsal area with a more or less distinct longitudinal carina or ridge, and two transverse ones; extreme margin with little tubercles; hind end little produced, with the usual round orifice.

♀. Pyriform; skin after boiling colorless, the contained embryonic larvae pink. Many small and slender rods, and double (figure-of-8) glands; skin sometimes suffused with brown; no legs; antennae represented by minute tubercles emitting two or three bristles; mouth-parts brownish, rather small, but well-developed; caudal tubercles rather long, with a short but rather stout bristle; anal ring with 6 hairs.

Eggs slate-grey, $\frac{2}{3}$ mm. long.

Embryonic larva with rows of figure-of-8 glands, instead of the spines of *Eriococcus*, etc. Antennae six-segmented, 3 longest, the others subequal; 6 oval, bristly; claw very long.

♂. Scale small, cylindrical, creamy white.

Hab.—Cañon City, Colorado, on twigs and stems of *Atriplex canescens*. Collected by Mr. E. Bethel; sent by Prof. Gillette. On one of the twigs is also a parasitised example of *Mytilaspis concolor* (Ckll.), which is new to Colorado. This was described as a variety of *M. alba*, but is doubtless distinct. The real *M. alba* (type locality Jamaica) must be added to the U. S. fauna, having just been found by Mr. Quaintance in Florida.

PALISOT DE BEAUVOIS' WORK ON THE INSECTS OF AFRICA AND AMERICA.

THE "Insectes recueillis en Afrique et en Amérique" has according to Hagen 90 plates. A collation of the two imperfect copies in the libraries of Harvard College and the Museum of Comparative Zoology give just this number but they are very irregularly numbered, and the following list may serve to show whether copies in other libraries are more complete or not.

Aptères, 1, 3, 4, 5, 6 = 5.

Coléoptères, 1, 1b, 1c, 1d, 1e, 2, 2b, 3, 3b, 3c, 3d, 4, 4b, 5, 6, 6b, 7, 8, 9, 11, 15, 30, 30b, 31, 32, 34, 35, 36, 37, 38 = 30.

Hémiptères, 1, 2, 5, 5b, 6, 7, 8, 9, 10, 11, 12, 19, 20, 20 = 14.

Orthoptères, 1, 1b, 2, 2c, 3, 4, 5, 7, 12, 13, 14 = 11.

Névroptères, 1, 2, 3, 7, = 4.

Lépidoptères, 1, 1b, 2, 2b, 2c, 3, 4, 5, 6, 6, 7, 20, 21, 22, 23, 24, = 16.

Hyménoptères, 1, 2, 3, 7, 8, 9, 10, = 7.

Diptères, 1, 2, 3, = 3.

There are two plates marked Hém. 20, one of Homoptera, the other of Heteroptera; and two marked Lép. 6, both species of "Papilio."

Samuel H. Scudder.

CORRECTION.—Line 10 on p. 237 should read: b'. Tegmina with *no* well formed intercalary vein.

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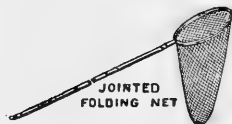
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PSYCHE.

DIPTERA OF THE ORGAN MOUNTAINS IN SOUTHERN NEW MEXICO.—II.

BY C. H. TYLER TOWNSEND, LAS CRUCES, NEW MEXICO.

In the latter part of August, 1897, a few days were spent collecting in Filmore Cañon, and on the main ridge of the Organs above its head. The more notable results of this collecting are here given. Filmore Cañon runs down the west slope of the range, and is about five miles long, its head being about 8,000 feet and its mouth about 5,000 feet altitude above sea. During the moister season of the year a stream of clear cold water courses down the cañon, flowing over sandy beds and amongst boulders, often dropping from a few to ten or fifteen feet over masses of rock, finally dashing down a wall about fifty feet in height some distance within the mouth of the cañon. At the time of the above visit the bed of the stream was for the most part dry in the upper three or four miles of its course, the water seeping out at intervals but soon disappearing again.

5. *Tersesthes torrens* Towns. Thirteen females taken on horses, at camp in Filmore Cañon, about 6,000 ft., August 29, 1897. They were particu-

larly bad about the horses' heads, especially about the eyes.

This species was discovered by me June 21, 1892, on the Continental Divide, 7,000 ft., six miles west of Patterson, in Socorro county, N. M. The genus and species were described in Psyche, January, 1893 (vol. 6, pp. 369-371, with pl. 8). The present specimens found in Filmore Cañon, Organ Mts., are the first and only ones that have come to notice since the discovery of the original specimens. The genus and species are easily recognizable by the descriptions and plate in Psyche.

6. *Volucella victoria* Will. Three males, top of ridge above head of Filmore Cañon, about 8,500 ft., August 28, two being taken on flowers of a grass, *Bouteloua* sp., prob. *hirsuta* Lag. (det. Tinsley), and the other on flowers of *Chrysopsis villosa* Nutt. var. (det. Tinsley).

7. *Copestylum marginatum* Say, var. One male, top of ridge above head of Filmore Cañon, about 8,500 ft., Au-

gust 28, on flowers of *Eriogonum jamesii* Benth. (det. Tinsley).

Length, 10½ mm. (not incl. antennae). Yellow stripe of cheeks not reaching oral margin. Antennae light yellowish red, except black arista. Yellow spots of frontal triangle subobsolete, pile black. Pile of thoracic dorsum black, of pleura whitish, no yellow on sides of dorsum nor in front of scutellum. Fourth abdominal segment with no trace of a band, wholly greenish black, clothed with white pile. The reddish yellow bands of second and third segments are well separated. Second and third segments of venter yellowish. Proximal half of tibiae yellowish, metatarsi more or less reddish.

This specimen can not be referred to Williston's var. *lentum*, but may be intermediate between *lentum* and the normal form.

8. *Cuterebra nitida* Coq. Two males, Filmore Cañon, about 6,000 ft., August 27, 1897. These specimens, and others which were seen but not captured, were found flying up and down the bed of the stream at the camp, and alighting on rocks beside or between the pools of running water.

They agree with Coquillett's description, except that the two opaque pollinose spots contiguous to the eyes are not distinct, and the abdomen shows faint suggestions of pollen in certain lights at extreme base.

9. *Peleteria iterans* Walk. Two females. One on flowers of *Chrysoopsis villosa* Nutt. var., top of ridge above

head of Filmore Cañon, about 8,500 ft., August 28. The other, Filmore Cañon, about 6,000 ft., August 27.

This is the species which I have always identified as *Echinomyia* (*Peleteria*) *iterans* Walk. According to Mr. D. W. Coquillett's Revision of Tachinidae of America north of Mexico (Techn. Bull. No. 7 Div. Ent. U. S. Dept. Agric.), this species would be known as *Peleteria tessellata* Fab. From a lack of evidence upholding the synonyms given in this work, I am constrained to continue to call this species *P. iterans*. There are many reasons which make the synonymy given by Mr. Coquillett under *Peleteria* and *Archytas* extremely doubtful. I have followed Williston's conception of *P. iterans* Walk. (Trans. Am. Ent. Soc. XIII, p. 301), in considering that it possessed the bristles contiguous to lower portion of eyes; while in the above "Revision" *iterans* Walk. is placed in *Archytas* in which these bristles are absent, and is moreover made a synonym of *A. lateralis* Mcq. (formerly known as *Jurinia lateralis*)! Further, we have only the author's dictum that the present species is the same as the European *tessellata* Fab.; while both Brauer and Bergestamm and van der Wulp, who ought to know the European form, have considered the American different. This is only one of the many examples of incongruity, and lack of substantiating evidence for statements made, to be found in Mr. Coquillett's paper, to which I shall have occasion to refer in detail at another time.

10. *Peleteria thomsoni* Will. Twenty specimens (18 ♂ and 2 ♀), varying from small to large, as follows: Sixteen males, top of ridge above head of Filmore Cañon, about 8,500 ft., August 28, six taken on flowers of *Eriogonum jamesii* Benth. One male and one female, Filmore Cañon, about 6000 ft., August 29, on flowers of *Gutierrezia sarothrae*. One male and one female in cop., Filmore Cañon, about 7000 ft., August 28, on flowers of *Gutierrezia sarothrae*.

11. *Gaediopsis monticola* n. sp. One male, top of ridge above head of Filmore Cañon, about 8,500 ft., August 28.

Length, 10½ mm. Differs from description of *G. setosa* Coq. (Rev. Tach. p. 136) as follows: Tibiæ yellowish red, the anterior ones blackish at base. Face and sides of front pale yellowish, former silvery and latter cinereous pollinose. Second antennal joint yellowish or reddish. Sides of abdomen on first, second, and third segments broadly pale

red, leaving a broader median area of black between, which widens posteriorly. Front at bases of antennæ twice as wide as either eye, at vertex one and one-fifth times width of either eye. The fine bristly hairs on sides of face are in two parallel approximated rows near margin of eyes, there being none between the lateral facial row and the facial ridge row. Cheeks as broad as one-half eye-height, clothed with bristly hairs. Antennæ four-fifths as long as face, third joint nearly or quite three times as long as second. First arisal joint as long as wide; second four or five times as long as first, and fully one-third total length of last joint, which is much tapered on its final third. The middle tibiæ each bear four macrochaetae on front side, the fourth or upper one the shortest, increasing in length to the lowest one which is longest. Otherwise agrees in all respects with the characters given for *G. setosa*.

NOTES ON NEW ENGLAND ACRIDIIDAE, IV,—ACRIDIINAE, III.

BY ALBERT P. MORSE, WELLESLEY, MASS.

22. SCHISTOCERCA Stål.

Schistocerca Stål 1873. Recensio orthopterorum, I, 73.

This genus includes locusts of large size and rapid and powerful flight; they are somewhat arboreal in habit, frequently alighting or feeding on trees and shrubs.

31. *Schistocerca rubiginosa* Harris.

Fig. 31.

Acridium rubiginosum. Harris Mss. in Scudder, Materials etc., Boston Journ. Nat. Hist., VII, 467 (1862); Thomas, Syn. Acrid., 170; Fernald, Orth. N. E., 31; Comstock, Introd., 106; Beutenmüller, Orth. N. Y., 304.

Acrydium rubiginosum. Smith, Orth. Ct., 370.

Schistocerca rubiginosa. Morse, List, 105.

Measurements from 104 ♂, 43 ♀:—Antenna: ♂, 13-14.5; ♀, 14-16. H. fem.: ♂, 16-19; ♀, 20.5-24; Teg.: ♂, 25-30; ♀, 32-41. Body: ♂, 28-33; ♀, 39-54. Total: ♂, 34-39; ♀, 44-53 mm.

One male from Connecticut has the dorsal margin of the tegmina pale in color but not of the bright yellow of *alutacea*. This species is much more uniform in color than *alutacea*, rarely or never showing any olivaceous, though males taken late in the season (Sept. 24-Oct. 30) at Wellesley have much of the rusty color replaced by gray. The tegmina are often almost immaculate.

It is more widely distributed in New England than *alutacea* and differs from it in preferring drier stations; I have found it most frequently in bushy pastures and wild land on sandy soil and along railway embankments, but otherwise its habits appear similar. My specimens were taken at various dates from Aug. 5 to Oct. 30 at Provincetown, Dedham (C. J. Maynard), and Wellesley, Mass.; Kingston and Wickford, R. I.; Thompson, Deep River, New Haven, North Haven, Stamford, and Greenwich, Ct. Among these is an immature female from Provincetown on Sept. 5.

32. *Schistocerca alutacea* Harris.

Fig. 32.

Acrydium alutaceum. Harris, Report on Ins. Mass. inj. to veg., p. 139 (1841), — Treatise, 3rd ed., 173;

Acrydium alutaceum. Smith, Orth. Ct., 373.

Acridium alutaceum. Scudder, Materials, 466; Thomas, Syn. Acrid., 171; Fernald. Orth. N. E., 31; Comstock, Introd., 106; Beutenmüller, Orth. N. Y., 304.

Schistocerca alutacea. Morse, List, 105.

Measurements from 113 ♂, 84 ♀:—Antenna: ♂, 15-17; ♀, 14.5-17.5. H. fem.: ♂, 17.5-19.5; ♀, 22.5-27. Teg.: ♂, 24-30; ♀, 36-42. Teg. pass H. fem.: ♂, 2-5; ♀, 5-8. Body: ♂, 28-32; ♀, 42-50. Total: ♂, 33-39; ♀, 48-54 mm.

The ground-color of this species varies remarkably in fresh specimens, ranging from olive-green through yellowish to deep reddish brown; the pronotum and tegmina while sometimes unspotted are usually and in some cases heavily marked with dusky blotches.

This species is easily distinguished from *rubiginosa*, the other common member of the genus, by the bright yellow mid-dorsal line, but there are also structural differences very noticeable on comparison: the head and prozona are narrower and the vertex and facial costa narrower and more prominent in *alutacea* than in *rubiginosa* (see figs.); *rubiginosa* also has stouter fore femora.

This species is common, even abundant locally, in southern New England. I have taken it at West Chop, Martha's

Vineyard, Mass., and Deep River, North Haven and Stamford, Ct., where I found it most at home in the long sedge and coarse weeds of moist meadows and bushy swamps. The males apparently greatly outnumber the other sex and being more active are more likely to be seen and secured than the relatively sluggish females. On warm days both sexes fly freely, frequently alighting on bushes and trees. Adults begin to appear in the second week of August but immature specimens may be found three weeks or a month later.

The last of August or early September is the most favorable time for collecting.

33. *Schistocerca americana* Drury.

Gryllus americanus. Drury, Illustr. Nat. Hist., vol. II, app., (1773) name?. Fig. in vol. I, pl. 49, fig. 2; described, p. 128, (1770).

Locusta tartarica? Drury, Exot. Entom., Westwood ed., vol. I, p. 121, pl. 49, fig. 2 (1839).

Acridium americanum. Scudder, Materials, 466; Comstock, Introduct., 106; Beutenmüller, Orth. N. Y., 304.

Six males, six females from Indiana give the following measurements:—Antenna: ♂, 12; ♀, 13-15. H. fem.: ♂, 23-24; ♀, 28-30. Teg.: ♂, 42-44; ♀, 50-55. Teg. pass H. fem.: ♂, 10-12; ♀, 12-16. Body: ♂, 39-42; ♀, 48-55. Total: ♂, 52-55; ♀, 62-68 mm.

This handsome locust will be readily recognized by its great size and con-

spicuous markings (see fig. in Comstock, and Beutenmüller, loc. cit.). It is rarely found in New England and must be considered a purely adventitious species, specimens observed being simply wanderers from the southwest. It has been taken several times in the vicinity of New York City and probably reaches southwestern Connecticut not very infrequently, but its occurrence near Boston was quite unexpected. On Oct. 1, 1883, it was found by Mr. F. H. Sprague at Wollaston, Mass., where it was "tolerably abundant in one spot on the beach, among the tall grass below high-tide mark" (Psyche, Dec. 1895, p. 318). In the vicinity of New York it is said by Beutenmüller to occur from early May to early July and again from the latter part of September to early November.

23. *Hesperotettix* Scudder.

Hesperotettix Scudder 1876. Bull. U. S. Surv. Terr., II, p. 262.

34. *Hesperotettix brevipennis* Thomas.

Ommatolampis brevipennis. Thomas, Bull. U. S. Geol. Surv. Terr., I, No. 2, 1st Ser., p. 67 (1874).

Hesperotettix viridis. Morse,—List, 103, 106.

Hesperotettix brevipennis. Scudder,—Rev. Melanopli, 63, pl. v, fig. 2.

Measurements from 24 ♂, 18 ♀:—Antenna: ♂, 7.25-8.5; ♀, 6.3-7.2. H. fem.: ♂, 9.5-10.5; ♀, 11.8-12.7. Teg.: ♂, 7.6-10; ♀, 9.7-11.7. Body:

♂, 15-17; ♀, 20-24 mm. The tegmina fall distinctly short of the end of the abdomen in both sexes, reaching on the hind femur a point from one-half to two-thirds the length of the latter from its base.

This is one of our rarer locusts and with its delicately contrasted tints of green and purple is one of our daintiest and most attractively colored species. I took one male, all that I could find, at Wellesley, Mass., in August, 1891, in the early days of my collecting. This specimen was referred to Mr. Scudder who determined it provisionally as *H. viridis* under which name it was recorded (Psyche VI, p. 262) and referred to in my List (Psyche VII, pp. 103, 106). In the succeeding July I found a female. The next year, owing to absence at the proper time, none were taken. In 1894 and '5 I took several. In 1896 my pupils and I secured a number from various points near the first locality. All were captured by sweeping vigorously the short, tufted growth of bunch-grass (*Andropogon scoparius*) which with other wild grasses and running-blackberry vines sparsely clothe the thin soil of the gravel-plain formation of Wellesley. It has since been found by Mr. F. H. Sprague, from whom I have received specimens, in a similar station at Walpole, Mass. (Psyche, VII, 439). In New Jersey it is said by Uhler to be not uncommon in the cranberry fields of Atlantic Co. While apparently very local it probably inhabits many parts of the three southern New England States.

The season during which it may be found seems to be relatively short; the Wellesley specimens were all taken between July 10 and Aug. 8, nymphs being secured on the first date and search in September proving unsuccessful. Mr. Sprague's specimens were taken on Aug. 30, but he was unable to find a male.

24. *PODISMA* Latr.

Podisma Latreille 1829. Cuvier, Regne Animal, v, p. 188 (Disciples' ed., Insectes, II, 24).

35. *Podisma glacialis* Scudd.

Pezotettix glacialis. Scudder, Boston Journ. Nat. Hist., vii, 630, 631, pl. xiv, figs. 9, 10 (1863). Smith, Orth. Me., 149; Thomas, Syn. Acrid., 148; Fernald, Orth. N. E., 29; Morse, List, 106.

Podisma glacialis. Scudder, Rev. Melanopli, 98, pl. vii, fig. 3.

Measurements from 48 ♂, 62 ♀: Antenna: ♂, 8-9; ♀, 7-8.5. H. fem.: ♂, 9.5-10.8; ♀, 10-12. Body: ♂, 15-17.5; ♀, 19-28 mm.

This singular and interesting locust is not uncommon on the mountains of New England in the latter part of summer. The specimens in my collection were taken between Aug. 14 and Sept. 6 on Mt. Ktaadn, Me. (F. P. Briggs); Speckled Mt., Stoneham, Me.; Mt. Kearsarge, N. H. (3250 ft.); Mt. Washington, N. H. (4000 to 5000 ft.); Mt. Ascutney; Windsor, Vt., and Mt. Greylock, Mass. (3500 ft.). It is also recorded from several points in the Adi-

rondacks, from Pennsylvania, and from Sudbury, Ont., Canada. At Jackman, Me., it has been found in "open woods and bogs" (Harvey, — Psyche, 1897, p. 77). Mr. Scudder states that "it frequents the close branches of the dwarf birch" in the White Mts. Some of my specimens were obtained from birch but most were found on or among

the various species of *Vaccinium* characteristic of the mountain-tops, and on *Ascutney* among dwarf cornel. It is a somewhat sluggish insect, relying chiefly for protection upon the similarity of its dark olive green coloring to that of the surrounding vegetation, though on warm days the males become fairly active.

A NEW PARASA, WITH A PRELIMINARY TABLE OF THE SPECIES OF THE GENUS.

BY HARRISON G. DYAR, WASHINGTON, D. C.

The Eucleid genera *Euclea* and *Parasa* are closely allied and indeed not well separated. There is a stronger tendency to the stalking of vein 10 of primaries in *Euclea*, but some species of *Parasa* show the same character. Judging from the American larvae alone there appear to be marked differences in the early stages of the genera; but the larva of *P. lepida*, a true *Parasa*, shows the more generalized *Euclea* form, proving that our *P. chloris* is a specialized offshoot, not a characteristic type for the genus.

Parasa is a widespread genus, being represented in all the continents except Australia and Europe. The following are its characters:—

Head partially sunken, untufted; palpi upturned, reaching half way to the vertex, third joint small, evenly clothed. Antennae of male pectinated on basal half, the tip simple, the two regions

usually sharply marked off, occasionally grading into each other; simple in female. Thorax smoothly haired, not scaly. Abdomen extending moderately beyond hind wings. Legs densely hairy; posterior tibiae with one pair of spurs. Fore wings with the costa straight, rarely convex, outer and inner margins rounded; two internal veins, 2 to 5 rather regularly spaced, 4 and 5 nearest at base; 6 from cross-vein, 7 to 9 stalked, rarely 10 also shortly stalked, 11 from cell, 12 from base; discal vein often forked and open. Hind wings with three internal veins, 2 to 5 regularly spaced, upper half of cell retracted, 6 and 7 usually stalked, 8 anastomosing with cell toward base with more or less distinct fine veinlets thrown off toward costa.

PARASA PRASINA n. sp.—Vertex of head and thorax green, a few brown hairs at base of fore wings and a very narrow central

brown crest. Fore wing green, a small, basal dark brown patch, widest on costa, a little angled on median vein and vein 1, narrowing to nothing at inner margin. Outer border very narrow, nearly confined to the fringe except between veins 5 to 8 where it widens inwardly; brown, shaded with silvery, edged within by a dark brown line. A very small brown discal dot. Hind wings creamy ochereous, the fringe brown and white. Below uniformly yellowish, fore wings a little greenish, fringe brown tipped. Front of head, palpi and pectus dark brown. Middle and hind legs yellowish. Vein 10 of fore wings from end of cell. Expanse 25 mm.

Two ♂s without definite locality, but from Mexico or Central America (Heyde). U. S. Nat. Mus., type no. 4019. Nearest to *P. imitata* Druce. The specimens mentioned in the *Biologia Cent. Am.*, (Lep. Het. II, 441 (1898)), from Costa Rica with hind wings pale cream color may be this species.

In the following synoptic table of Parasa I exclude certain species listed by Kirby. Of these *aetitis* Wall. and *gemmans* Feld. belong to *Taeda* according to Karsch; *ancilis* Wall. is the type of *Ectropa* Wall., a genus very distinct from *Parasa* as I learn from the structural details that Sir G. F. Hampson has kindly sent me; *rubriplaga* Walk. and *unicolor* Moore belong to *Idonauton* and *Natada* respectively (vide Hampson's *Moths of India*). Besides these I have excluded provisionally all species without any green marking on the thorax as needing to be reexamined structurally. They are *biguttata* Walk., *cruda* Walk., *cupreiplaga* Walk., *cupreistriga* Walk.,

humilis Mab., *vetusta* Walk., *rubicunda* Walk., *rudis* Walk., *pallida* Möschl., *chlorostigma* Snell., and *dentata* Hamps. The latter species differs in structural characters from *Parasa* as the male antennae are serrate throughout. I would propose that it be made the type of a new genus, *HAMPSONELLA*, with the characters given in the "*Moths of India*."

Synoptic Table of Parasa.

1. Thorax green, wings without any green marks 2
 Thorax green at least in part, wings with a green band 4
2. Fore wings shaded with brown broadly at outer margin 3
 Fore wing outwardly marked by a series of intervenular areas
arcuata Karsch (East Africa)
3. Basal space discolorous; expanse 25 mm.
lysis Druce (Mexico)
 Basal space unicolorous for two-thirds of wing; expanse over 30 mm.
herbifera Walk. (India)
4. A brown spot in the green band at end of cell 5
 No brown discal spot; at most an olivaceous one 8
5. Outer brown border roundedly waved 6
 Outer brown border with an inward point opposite the cell
laranda Druce (Mexico)
6. Thorax brown on the collar
laonome Druce (Mexico)
 Thorax all green or a narrow brown crest only 7
7. Hind wing brown; outer border of fore wings evenly brown
imitata Druce (Mexico)
 Hind wing yellowish; outer border of fore wings washed with white beyond its limiting inner line
prasina Dyar (Mexico)

8. Thorax brown centrally . . . 9
 Thorax with a brown spot on each side
humeralis Walk. (East Indies)
 Thorax green throughout, except rarely
 a fuscous border 12
9. A silvery white line bordering the marginal band 10
 No silvery white line
lepida Cr. (India)
10. Head brown; tegulae with only a small green spot *dharmia* Moore (India)
 Head green; tegulae all green . . . 11
11. Basal brown area of fore wings present
repanda Walk. (India)
 Basal brown area absent
argenteilinea Hamps. (India)
12. Median green band of fore wings appearing as if constricted centrally . . 13
 Median band not appearing constricted 14
13. Hind wings yellowish; expanse about 60 mm.
chapmani Kirby (Central West Africa)
vitilena Karsch (Central West Africa)
 Hind wings darker on outer third; expanse about 25 mm.
chlorozonata Hamps. (India)
14. Marginal border of fore wings even, not indented; no detached brown specks in the green area 15
 Marginal brown band of fore wings irregular or broken into detached spots 25
15. Fore wings marked with white . . . 16
 Fore wings not marked with white . . 18
16. Outer margin brown 17
 Outer margin white
singularis Butl. (Madagascar)
17. An olivaceous discal dot
reginula Saal. (Madagascar)
 No discal dot *valida* Butl. (Madagascar)
18. Outer border of fore wing narrow (less than $\frac{2}{10}$ of wing) 19
 Outer border moderate or broad (over $\frac{2}{10}$ of wing) 22
19. Large species (60 mm. expanse)
euchlora Karsch (West Africa)
 Moderate sized species (35 mm. or less) 20
20. A brown spot in the center of outer band
indeterminata Boisd. (No. America)
 Outer band uniform 21
21. Palpi and legs dark green
neumanii Karsch. (East Africa)
 Palpi and legs brown
viridula Walk. (South Africa)
22. Margin brown, cut by darker veins and edged within by a darker line . . . 23
 Margin brown with inner and central darker or grayish shades and extending further than usual along the inner margin *cebrennis* Schaus (Mexico)
 Margin brown, marked with a row of lighter lunules within the limiting brown line
zulona Reak (East Indies)
 Margin testaceous, edged within by a brown line *latistriga* Walk. (—)
23. Margin moderately wide (.21-.26 length of wing), the included nervules continuously lined in darker brown . . 24
 Marginal border very wide (.4 of surface), the included nervules appearing as if suddenly excised near the margin
lorquinii Reak. (East Indies)
24. Under side yellowish
chloris H. S. (North America)
minima Schaus (Mexico)
 Under side greenish cinereous
sinica Moore (China)
25. Abdomen and hind wings green above 26
 Abdomen and hind wings yellow or brownish 27
26. Legs brownish
viridissima Holland (West Africa)
 Legs dark green
satura Karsch (West Africa)
27. Basal brown patch present 28
 Basal brown patch absent on costal edge, above median vein
similis Feld (India and South Africa!)
- Basal brown patch absent 34
28. Marginal band brown 31
 Marginal band yellow except on the veins 29

29. Basal patch yellow, covering the cell
isabella Moore (India)
Basal patch smaller, not covering over
half of the cell 30
30. Some red-brown suffusion in the green
pastoralis Butl. (India)
No suffusion in the green band
consocia Walk. (China)
31. Basal patch broad toward internal margin, dentate a little on median and internal veins 32
Basal patch narrow on internal margin, mostly a costal patch 33
32. Outer border nearly even with dentate projections inward
prussi Karsch (West Africa)
punica H. S. (India)
Outer border waved inwardly
ebenani Saal. (Madagascar)
hilaris Westw. (India)
anani Karsch (West Africa)
affinis Mab. (Madagascar)
urda Druce (West Africa)
karschi Dyar * (East Africa)
33. Costa convex, palpi slender; a considerable projection of basal patch along median vein; outer border irregular
hilarula Staud. (Asia)
Basal patch without projection; outer border twice curved
viridiplena Walk. (Brazil)
34. Narrow terminal border with an enlargement at outer and inner margins. Thorax edged with fuscous 35
Narrow terminal border entire; some small detached spots in the green field
bicolor Walk. (India)
35. A brown patch above the anal angle on outer margin; no white dot
hampsoni Dyar (India)
This patch large between veins 3 to 5; a white dot in patch on inner margin
albipuncta Hamps. (India)
- Note.*—Where more than one species occurs under the same heading, I have not been able to separate them satisfactorily with the material at hand. Species not placed, *hilarata* Staud. (Asia). The species at the end of the table must closely resemble *Taeda*. If they were not placed in *Parasa* by Hampson without indication of different structure, I should question the generic reference.
- * = *valida* Karsch, preoccupied by the Madagascarin species of Butler.

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SAMUEL HENSHAW, Treas.,
Cambridge, Mass.

MANUAL OF N. A. DIPTERA.

Manual of the Families and Genera of North American Diptera, by S. W. Williston. Paper, \$2.00; Cloth, \$2.25.

J. T. HATHAWAY,
297 Crown St., New Haven, Conn.

PSYCHE.

NOTES ON NEW ENGLAND ACRIDIIDAE, IV,—ACRIDIINAE.—IV.

BY ALBERT P. MORSE, WELLESLEY, MASS.

25. *Melanoplus* Stål.

Melanoplus Stål 1873. Recensio orthopterorum, I, p. 79.

To this genus belong most of the locusts of medium size that swarm in our fields in late summer and early autumn in countless numbers and are popularly called "grasshoppers."

36. *Melanoplus atlanis* Riley.

Figs. 36, a, b, c, d.

Caloptenus atlanis. Riley, Ann. Rep. Ins. Mo., VII, 169, (1875).

Melanoplus atlanis. Fernald, Orth. N. E., 33; Beutenmüller, Orth. N. Y., 306; Scudder, Rev. Melanopli, 178.

Melanoplus atlantis. Comstock, Introd., 110; Morse, List, 106 (typ. error).

Measurements from 208 ♂, 135 ♀; — Antenna: ♂, 7-8.5; ♀ 6.5-8. H. fem.: ♂, 10-13; ♀, 10-14. Teg.: ♂, 15-21; ♀, 14.5-22. Body: ♂, 17-21.5; ♀, 16-27. Total: ♂, 20.5-27; ♀, 20-29 mm. The tegmina pass the hind femora from 1.5 to 6 mm.

The separation of the females of this species from those of *femur-rubrum* will cause the novice considerable difficulty, and examples are occasionally met with

that puzzle even the expert. The characters presented by the prosternal spine, the cerci, and the ovipositor as indicated in the key are the most valuable and when summed up will in all but a very few cases enable one to decide with certainty.

The hind tibiae of this species are normally red, but in about ten per cent of the specimens they are either reddish at tip and otherwise colored at base, or luteous, glaucous, or bluish. In this respect males are more variable than females.

This species is found over the whole of New England from Nantucket to Canada, from the seashore to the alpine tops of the White Mts. It appears early in the season (June 17-21) and is found late in the fall (Nov. 16).

It is seldom found except in dry situations, and is most abundant in hilly regions where it frequents sandy or gravelly spots and the slopes on light soil. In favorable localities it is found in immense numbers and causes much damage. Probably to this species should be laid much of the destruction attributed to *femur-rubrum* in early accounts of locust ravages in New England.

37. *Melanoplus scudderi* Uhler.

Figs. 37, a, b.

Pezotettix scudderi. Uhler, Proc. Ent. Soc. Phila., II, 555, (1864). Smith, Orth. Ct., 370; Thomas, Syn. Acrid., 152; Comstock, Introd., 107; Morse, List, 106; Beutenmüller, Orth. N. Y., 309.

Melanoplus scudderi. Scudder, Rev. Melanopli, 212, pl. xiv, figs. 5, 6.

Measurements from 82 ♂, 84 ♀:—Antenna: ♂, 6.5-7; ♀, 6-7. H. fem.: ♂, 10-11; ♀, 11-13. Teg.: ♂, 4-5.5 (average 5, 2 examples 8 and 8.5); ♀, 5-8 (av. 6, a little more than pronotum). Body: ♂, 15-18; ♀, 17-24 mm.

This species is unlikely to be mistaken for any but *mancus* whose range overlaps its own. It is much more likely to be passed by as an immature form. It is a local but common species, often abundant in favorable localities and seems to prefer dry hillsides among bushes, roadsides, and open woods. Some years ago it was quite plentiful among the rocks and bushes on the talus slope at the foot of West Cliff, New Haven, Ct. It has been reported from Brunswick, Me., Springfield, Mass., and many points in the South and West. Personally, I have met with it only in Connecticut in the latter part of August but it probably occurs in many parts of central Massachusetts and it should be looked for from the first of August until late in the fall.

38. *Melanoplus mancus* Smith.

Figs. 38, a, b, c.

Pezotettix manca. Smith, Orth. Me., in Proc. Portland Soc. Nat. Hist., I, (1868), p. 149. Thomas, Syn. Acrid., 149; Fernald, Orth. N. Y., 30, Morse, List, 106.

Melanoplus mancus. Scudder, Rev. Melanopli, 218, pl. xiv, fig. 9. Measurements from 70 ♂, 83 ♀.—Antenna: ♂, 6.5-7; ♀, 6.5-7. H. fem.: ♂, 8.3-9; ♀, 10-12. Teg.: ♂, 2-4; ♀, 3-5. Body: ♂, 14-17.5 (average 15+); ♀, 18-25 (av. 21) mm.

This species has been found at but four points in New England, three in the north and one in the south. The type locality was Speckled Mt., Stoneham, Me.; I have taken it there and on Kearsarge Mt. near No. Conway, N. H., at an altitude of 2000 to 3250 ft. Mr. Scudder has found it on Mt. Sargent, Mt. Desert Id., Me., and Prof. Blatchley took it at North Madison, Ct. This latter locality is especially interesting as it had previously been found only at high levels. It is apparently quite local, but continued collecting is likely to reveal its presence at many additional and intermediate points. The present season (1898), I found it common on the summit of Ascutney Mt. (3300 ft.), Windsor, Vt.

On Speckled Mt. where most of my specimens were secured, I found it plentiful, associated with *Podisma glacialis* among the various species of *Vaccinium* on the bare upper portions of the mountain. It is quite alert and agile, when approached springing suddenly and to a considerable distance,

sometimes making several leaps in succession.

It probably matures in late July or early August as it has been taken on the mountains from Aug. 14 to Sept. 6.

39. *Melanoplus fasciatus* Walker.

Figs. 39, a.

Acridium fasciatum Barnston Ms. Walker, Cat. Dermapt. Salt. Brit. Mus., iv, p. 680 (1870).

Caloptenus fasciatus. Thomas, Syn. Acrid., 224.

Pezotettix borealis. Scudder, Mat., 464; Thomas, Syn. Acrid., 153; Smith, Orth. Me., 149; Fernald, Orth. N. E., 30; Morse, List, 106.

Melanoplus borealis. Beutenmüller, Orth. N. Y., 308.

Pezotettix septentrionalis. Morse, Psyche (1894), 53.

Melanoplus rectus. Fernald, Orth. N. E., 32; Morse, Psyche (1894), 53.

Melanoplus fasciatus. Scudder, Rev. Melanopli, 267, pl. xviii, figs. 2, 3, 4.

Measurements from 83 ♂, 123 ♀:—
Antenna: ♂, 7.5-9; ♀, 6.5-8.5. H. fem.: ♂, 9.3-10.7; ♀, 10.7-12.7. Teg.: ♂, 7.5-10.5; ♀, 9-12. Body: ♂, 16-19; ♀, 16.5-25.5. Teg. vs. H. fem.: ♂, -3.5--5; ♀, -3.5--6. Body vs. H. fem.: ♂, -2--3; ♀, -2+3 mm.

A long-winged form is known from Michigan, but has not been detected in New England. This species is very variable in color, the upper parts, while usually of a dark reddish brown, are sometimes dark olivaceous gray and occasionally are strikingly varied with

white. The only species likely to be confused with it in New England is the short-winged female of *extremus*.

This much-named locust is a somewhat local but common and widely distributed species. I have found it most frequently among huckleberry bushes growing in and along the edges of open pitch-pine woods where it is frequently associated with *Chloealtis conspersa*. While usually numerous in individuals persistence is needed to secure many specimens, as the ground may be covered several times with equally good results, only a few being taken at one trip. When startled it leaps well, but may usually be secured without a net.

Adults appear in the latter part of June, and may be found as late as September or October. I have taken it from June 14 to Sept. 5, at Speckled Mt., Stoneham, Me., Thompson, Ct., West Chop, Martha's Vineyard, Provincetown, Winchendon, Waltham, Sudbury, Sherborn, Dedham, and Wellesley, Mass.

40. *Melanoplus femur-rubrum* DeG.

Figs. 40, a-d.

Acrydium femur-rubrum. DeGeer, Memoires pour servir a l'histoire des Insectes, t. III, p. 498, pl. 42, fig. 5. (1773). Harris, Treatise, 173.

Caloptenus femur-rubrum. Scudder, Materials, 464; Smith, Orth. Me., 150, —Orth. Ct., 362; Thomas, Syn. Acrid., 163.

Melanoplus femur-rubrum. Fernald, Orth. N. E., 33, Comstock, Introd., 110,

Morse, List, 106, Beutenmüller, Orth. N. Y., 306, Scudder, Rev. Melanopli, 278, pl. xix, figs. 1-4.

Measurements from 258 ♂, 173 ♀:— Antenna: ♂, 6.5-10; ♀, 6.5-9. H. fem.: ♂, 10.7-13.3; ♀, 11-15. Teg.: ♂, 13-20; ♀, 15.5-23. Body: ♂, 16-23; ♀, 18-28. Total: ♂, 18.7-27.5 (average 23-25); ♀, 22-30.7. Teg. vs. H. fem.: ♂, = to +5; ♀, -1 to +5.

Though extremely plentiful, no marked varieties occur in this species in New England, the only variation worthy of note being in the color of the hind tibiae. These are so constantly red that a locust having them colored otherwise may be looked upon as almost sure to belong to another species, *atlanis*, *minor*, or *extremus*. Still, examples of *femur-rubrum* do occur with tibiae either pale (yellowish), or even greenish or blue. These are, however, extremely rare.

This is undoubtedly the commonest, most ubiquitous, "grasshopper" found in New England, occurring everywhere throughout the district in every plat of grass or sedge from sea-shore to mountain-summit. The destruction caused from time to time by locusts in New

England is usually ascribed to this species, and with good reason, though in some cases, particularly when caused by migratory swarms, it is probable that *atlanis* is largely if not chiefly concerned. In August, 1892, I received complaints of grasshopper injuries to garden crops, tomatoes, beans, etc., in the vicinity of Norway, Me. These proved on investigation to be entirely due to this species, which was very abundant locally, and no specimens of *atlanis* could be found. It is very plentiful at times on some of the islands off shore, as I have found it on Cuttyhunk, Mass., and Block Island, R. I., where it had the habit of collecting in great numbers on the warm, sunny sides of stone walls in the late afternoon and remained over night.

While it is almost ubiquitous it is in general most plentiful in meadows and the damper portions of mowinglands and pastures, among the more dense and succulent vegetation.

It reaches maturity in the latter part of July and is found throughout the rest of the season; I have taken specimens in the vicinity of Wellesley from July 25 to Nov. 8.

SOME NEW GENERA OF BEES.

BY WILLIAM H. ASHMEAD.

Assistant Curator Department of Insects U. S. National Museum.

Family NOMADIDAE.

Zacosmia n. g.

Marginal cell elliptical, not longer than the first cubital and separated from the costa

at apex; the submarginal cells along the cubitus are of unequal length, the first and third subequal, the second either petiolate or narrowed into a point above; scutellum subbilobed, the axillae rounded or convex be-

hind; abdomen short, above subglobose, beneath flat; body covered with a short dense fine downy pubescence resembling mold; abdominal segments 2-5 ornamented at their apical margins with a peculiar series of brown triangular emarginations impressed upon the densely pubescent surface; labial palpi 3-jointed, the first joint stout, longer than joint 2-3 united; claws with a tooth within. Type *Melecta maculata* Cresson.

This genus comes apparently very close to *Leiopodus* Smith, but differs decidedly in the venation of front wings; in the shorter abdomen with its peculiar emarginated or zigzag ornamentation, which is quite unique in the group; in having the labial palpi 3-jointed not 4-jointed; and by the claws having a strong tooth within.

An examination of the type of Mr. Cresson's genus *Coelioxoides*, last December, has convinced me that it has nothing to do with the subfamily *Coelioxinae* and that it should be placed with this family.

Family STELIDIDAE.

Subfamily I, STELIDINAE.

Melanostelis n. g.

Differs from the four other genera belonging to this family, namely, *Protostelis* Friese, *Stelidomorpha* Morawitz, *Stelis* Panzer and *Parevaspis* Ritsema, by having the second submarginal cell receiving both recurrent nervures.

In the genera mentioned, the second recurrent nervure is received *behind* the second transverse cubitus, or it is interstitial. Its other characters are: Mandibles tridentate; maxillary palpi 2 jointed; abdomen black or blue-black, with white bands, the last dorsal segment compressed into a carina at apex, while the last ventral segment is tridentate at apex. Type *M. betheli* n. sp.

Melanostelis betheli n. sp.—♀.—Length 9 mm. Black, clothed with sparse black hairs, the face with a few grey hairs inter-

mixed with the black hairs; abdomen above with subapical white bands on first four segments, those on the first and second extending all across the back to the lateral margins, the one on the third much abbreviated, while the one on the fourth is reduced to an oblong white mark; legs black, but the tibiae and tarsi have a piceous tinge in certain lights; tibiae at apex produced outwardly into a strong angulated process; basal joint of hind tarsi much thickened; tibial spurs long, strong.

Hab.—Olympia, Washington.

Described from a single specimen, received from Mr. L. Bethel, captured June 2, 1897.

The genera of the *Stelidinae* now known, may be tabulated as follows:—

Genera of the Stelidinae.

Second recurrent nervure received behind the second transverse cubitus or interstitial 2
Second submarginal cell receiving both recurrent nervures.

Abdomen black or blue-black, with white transverse bands; mandibles tridentate; maxillary palpi 2-jointed; last ventral segment tridentate, ♂ unknown.

Melanostelis Ashm.

2. Abdomen black or rufous, sometimes ornate with white or yellow spots; maxillary palpi 1 or 2 jointed (rarely wanting); labial palpi 4-jointed.

Scutellum without lateral teeth behind.

Head as wide as the thorax; clypeus not lengthened, well rounded; maxillary palpi 1 or 2 jointed; abdomen semiglobose, the segments broadly banded with yellow or white as in *Anthidium*, ♀ with the anal segment entirely rounded; ♂ ending in a strong thorn.

Protostelis Friese.

Head as wide as the thorax; clypeus lengthened and deeply emarginate; maxillary palpi 1 jointed; abdo-

men cylindrical, the segments with large white spots; ♀ with the apical margin of the sixth segment toothed; ♂ with the seventh segment armed with a tooth. *Stelidomorpha* Morawitz.

Scutellum with lateral teeth behind.

Head narrower than the thorax; clypeus rounded not lengthened; maxillary palpi 2 jointed; abdomen rounded, black, rarely with small indistinct maculae; ♂ with the seventh segment rounded.

Stelis Panzer.

Abdomen black, or rufous and black, clothed with a scattered griseous pubescence; mandibles tridentate.

Scutellum rounded and produced behind over the base of the abdomen, the apex with a deep median depression; apical abdominal segment in ♂ tridentate.

Parevaspis Ritsema.

Subfamily II, COELIOXINAE.

Neopasites, n. g.

Differs principally from *Phileremulus* Ckll., and *Neolarra* Ashm., by having a long marginal cell, which is much longer than the stigma, rounded at apex with a slight appendage. The front wings have two complete submarginal cells, the first being the longer. It also differs from *Pasites* Jurine, *Homachthes* Gerstaecker, and *Schmiedeknechtia* Friese, in that the first recurrent nervure joins the first submarginal cell. Type *Phileremulus fulviventris* Cress.

Hoplopasites, n. g.

This new genus falls in a group of genera near *Melittoxena* Morawitz and *Caenoprospis* Holmberg: The axillae are acute or toothed at apex, the scutellum proper (middle lobe) also armed with a median tooth at apex, so that apically, with the

acute axillae, the scutellum appears tridentate. The abdomen is red and black, the segments being banded with an appressed whitish pubescence. Type *Phileremulus productus* Cress.

Family PANURGIDAE.

Hylaeosoma n. g.

Comes nearest to the genera *Dasygoda* Latr. and *Calliopsis* Smith, in having the first submarginal cell distinctly longer than the second, but differs from both, in having the median cell much longer than the submedian.

The front wings have two recurrent nervures, the first received by the first submarginal cell, the second received by the second submarginal cell near its apex, the latter cell being almost quadrate, a little wider (or higher) than long.

The head, seen from in front is oblong, nearly twice as long as wide, the eyes being very long, three times as long as wide. Antennae clavate, the flagellum being gradually thickened towards apex. Maxillary palpi 6-jointed; labial palpi 4-jointed, the first joint the longest. Mandibles tridentate at apex.

Type *H. longiceps* Ashm. MS. from St. Vincent.

Cockerellia n. g.

To this genus belong most of the species described recently by Prof. Cockerell under the genus *Perdita*.

It differs decidedly from *Perdita*, as defined and figured by Smith, in having much longer 4-jointed labial palpi, the first joint being very long and usually somewhat thickened, *fully twice as long or even more than twice as long as joints 2-4 united*; supraclypeal plate quadrate, separated; clypeus at base trapezoidal: hind trochanters apparently without flocculus; color aeneous, bluish, or black, usually with pale markings, the abdomen always banded or maculated; claws cleft. Type *Perdita? hyalina* Cresson.

Philoxanthus n. g.

Agrees very closely with *Cockerellia* in venation and palpal characters, but is readily distinguished by the color of body which is wholly yellow, the abdomen being immaculate; the supraclypeal plate not being distinctly separated; the clypeus being semi-circular at base; while the hind trochanters have a distinct flocculus; claws simple. Type *Perdita beata* Ckll.

Nomadopsis n. g.

Separated at once from *Perdita*, *Cockerellia* etc. by the longer marginal cell which is much longer than the stigma, fully twice as long, or as long as or longer than the first discoidal-cell; submedian cell a little shorter than the median; maxillary palpi 4-jointed, the first joint very long, fully 7 times longer than joints 2-4 united, with a contraction at base. Type *Perdita zonalis* Cr.

NEW TETTIGONINAE, WITH NOTES ON OTHERS.

BY C. F. BAKER, AUBURN, ALA.

Xerophloca major n. sp. Length 7.5 mm., width across pronotum 2.5 mm. Larger, more robust, and more coarsely pitted than *viridis*. The vertex proportionally much larger than in *viridis*, and broadly, evenly rounded in front, nor at all even subangulate.

Described from two females in the National Museum, collected by Mr. E. A. Schwarz in Virginia. In the National Museum there is also a specimen from the Fitch cabinet, bearing the label "*Xerophloca major*, Arkansas, W. S. Robertson." I have a large series of *viridis* Fab. from California, Colorado, Arizona, New Mexico, Texas, Kansas, Alabama, and Brazil. *Major* differs as above stated from anything in this series. The forms of this genus, occurring in the Northeast, should be collected in large series at many points.

Tettigonia geometrica Sign. This species is found in the United States, but has probably been confused with *bijida* Say, which it resembles in a most striking manner. Besides some minor details, *geometrica* is smaller and lacks the whitish lines on elytra. I have it from Illinois, Washington, D. C., Alabama and Louisiana.

Tettigonia circellata n. sp. Length 6-6.5 mm. Pale yellowish, the legs and base of

venter sometimes bright orange. Front usually with two longitudinal black stripes on disc, a very short one on margin next each antenna, and one transverse on clypeal suture; all these markings may be obsolete. Vertex with a black point at tip and another at center of disc; two very short transverse lines behind, their inner ends embracing the ocelli, and a large incurved line on each side near the anterior margin, arising near the tip; these markings vary in intensity but are distinct in all the specimens. Pronotum, except anterior margin, pale blue; disc with four black spots, one on either side before the middle and one on either side behind the middle; other small dots may occur between these. Scutel yellowish, with two more or less exposed dots at base and transverse line, black. Elytra bright blue by reflected light, the apical margin transparent and the principal veins blackish; by transmitted light, the elytra appear deep smoky, with a slight bluish tinge. Wings deep smoky throughout. Prosternum, dorsum largely, and sometimes a median longitudinal row of small dots on venter, black or blue-black.

Last ventral segment of female twice length of preceding, medially raised into a strong keel, the acute point of keel termin-

ating the sharply angled hind margin. Plates of male once and a half the length of preceding segment, narrow and slender, very gradually narrowed to tips.

Described from several males and females collected at Los Angeles, Cal., by Prof. A. P. Morse, at Prescott, Ariz., by Dr. R. E. Kunze, and one specimen in the National Museum, taken at Los Angeles by Mr. Koebele. This, one of our prettiest *Tettigoniids*, has long borne the above Ms. name of Dr. Uhler.

Tettigonia cythura n. sp. Length ♀ 5 mm., of ♂ 4.25 mm. Pale yellowish, dorsum and more or less of sternum, black. Face without distinct markings. Vertex with three black dots on front edge; one at center and one on either side; on either side of the disc, near front edge and parallel with it, is a black line which originates back of the point and terminates over the frontal suture; two fine median longitudinal lines on posterior half of disc, and a small spot on either side between ocellus and eye, black. Pronotum bright green, front margin yellow, broadening laterally. Scutellum with the transverse impressed line and three very fine lines connecting it with hinder margin, black, causing the whole to appear like a black double loop on basal half. Elytra bright green by reflected light (smoky by transmitted) with a bluish tinge along the claval suture and base of costal margin, the principal veins more or less darkened, the apical margin transparent. Wings deep smoky.

Last ventral segment of the female twice the length of preceding, the hind margin acutely angled, the edge emarginate on either side of the acute point. Male plates of medium length, slender, narrowing to acute, slightly diverging, dark brown points.

Described from one female and numerous males, collected at Palm Springs, Cal., by Prof. A. P. Morse. I have one specimen from Arizona, received from the Cornell University collection. This fine little species has long borne the above Ms. name of Dr. Uhler.

Tettigonia aurora n. sp. Length of ♀ 7 mm. Pale yellowish, legs inclining to orange, dorsum bright carmine. Front with three longitudinal black lines nearly throughout its length on the disc, two abbreviated dashes above, and two dots on each lateral margin, one at antennal pit, the other at clypeal angle. A transverse row of three black spots on each gena. Clypeus with a dark median line. Front edge of vertex with three black dots, one at center and one on either side. Disc of vertex with a black line on either side, near and mostly parallel with front edge, extending from a short longitudinal dash near median line and just back of apex to the frontal suture; basal half of vertex with four equidistant rectangular spots, the two outer including the ocelli, the two inner somewhat elongate. Pronotum pale, slightly tinged with reddish posteriorly, with a row of six rectangular black spots near anterior margin, and a row of four smaller ones near hind margin; disc with four indistinct longitudinal lines. Scutellum yellow, with the transverse impressed line, a median longitudinal stripe, and two dots at base black. Elytra brick red, the principal veins paler, the inner apical all transparent. Wings infuscated.

Last ventral segment of female twice the length of the preceding, hind margin broadly rounded.

Described from two females collected in Arizona and received from the Cornell University collection. This is another of Dr. Uhler's Ms. species, and the three are described under these names at his request.

A NEW FORM OF PULVINARIA.

BY G. B. KING AND T. D. A. COCKERELL.

Pulvinaria innumerabilis subsp. *tiliae*.
subsp. nov.

♀. Scale 6 mm. long, 5 broad, 2 high, varying in size, sometimes as much as 8 mm.

long. Ovisac and form of insect as in *innumerabilis*. Body grey, with some lighter patches and black spots, giving a mottled appearance which is characteristic. Dried specimens become reddish-brown or greyish. Eggs white.

Antennae usually 7-segmented, the several segments measuring as follows in $\mu\mu$:—(1) 37. (2.) 39. (3.) 54. (4.) 68. (5.) 25. (6.) 17. (7.) 42. Formula 4372156. By the division of 4, the antennae become 8-segmented, the measurements in $\mu\mu$ being:—(1.) 39. (2.) 31. (3.) 56. (4.) 42. (5.) 25. (6.) 20. (7.) 23. (8.) 45. Formula 38412576. Of course these measurements vary more or less in different individuals. Legs ordinary; front leg with coxa 70, femur 152, tibia, 113 tarsus, 65, claw 20 $\mu\mu$. All the digitules filiform, tarsal digitules very long. Marginal spines blunt, 34 to 37 $\mu\mu$ long.

Hab.—On *Tilia americana*, Methuen, Lawrence and Andover, Mass., June 1898. (*G. B. King*). This insect is described as a subspecies of *innumerabilis*, because it is very closely allied to it, and evidently a comparatively recent segregate. It will probably be treated as a distinct species when the genus is revised. The mottled appearance is found by Mr. King to be constant and distinctive. The microscopical characters are nearly those of *innumerabilis*, but the antennal segments seem to be constantly shorter, and the marginal spines longer, than in that insect.

JANET ON MYRMECOPHILOUS ANIMALS.

The literature upon myrmecophily is so extensive and scattered that a work which gives a general survey of the subject is certainly welcome. Such a desirable work is Janet's "Rapports des animaux myrmécophiles avec les fourmis" (Limoges 1897, 8°), a pamphlet of nearly one hundred

pages, dealing chiefly with insects, in a systematic and comprehensive way, although discussing also certain Nematodes, Isopods and Arachnids.

In view of the fact that almost thirteen hundred species of myrmecophilous animals are known, the work is necessarily concise, but the author has condensed a large amount of information into a comparatively small space and has wisely supplemented his statements at every step by references to original sources of information, which number two hundred titles. The results of other workers are well summarized and original observations abound throughout.

Those animals only are regarded as truly myrmecophilous which, for whatever reason, actually seek the society of ants and voluntarily come to live in their nests. From this definition, therefore, are excluded Aphids and Lycaenid larvae, certain enemies, enslaved ants and many insects which mimic ants. Janet considers these, indeed, but devotes special attention to true myrmecophily, comprising the following categories, each of which is examined in detail: *parasitism*; *phoresy*, denoting the utilization of ants for transportation; *myrmecoclepty*, signifying the theft of food from ants; *synechtry*, the consumption of ants as food; *synoeky*, to express the habits of such animals as enter ants' nests for debris, warmth, shelter, etc., have no direct relations with the ants themselves and are tolerated by the latter; and *myrmecoxeny*, a special kind of symbiosis.

Reserving the term *symbiosis* to imply mutual benefit, Janet suggests the word *hamabiosis* to signify the habitual dwelling together of two species, for any purpose, with or without evident advantage, either mutual or one-sided.

In this country, myrmecophily offers a large, fresh and fascinating subject for study, requiring not only minute observation and great patience but also considerable mechanical ingenuity.

NOTE ON THREE PYRALID MOTHS
OF THE GENUS PACHYZANCLA.

Mrs. E. M. SWAINSON lately sent me three pyralids which she had bred in Jamaica, with the pupa-shells and her notes on the larvae. Sir G. F. Hampson has been so kind as to identify the species for me, so the breeding notes may as well be published.

(1.) *Pachyzancla semilanata* Hampsn. — Larva nearly an inch long, soft creamy; head small, shiny, jet black, black marks on neck. The larva is so transparent that the movements of the internal parts can be seen. Pupa (as also in the two following species) folded in a leaf; pupa-shell ferruginous, more shiny than that of the next. Larva pupated Aug. 7, and gave imago Aug. 15. A leaf-roller. This species was originally described in 1895, from St. Vincent.

(2.) *Pachyzancla aegrotalis* Zell. — Larva $\frac{3}{4}$ inch long, shiny, watery green; seems white, "but on back the dark green shows through," head and sides white. Pupa shell dull ferruginous. Larva pupated July 30, and gave imago Aug. 9. Feeds on guineahen weed, and a wild bush with shining dark green leaves.

(3.) *Pachyzancla phaeopteralis* Guen. — Larva nearly an inch long, clear watery green, with minute grey-brown spots all over, dark mark down middle of back, head buff, black marks on neck. Folds leaf over it. Pupa shell darker and more shiny than that of *P. aegrotalis*. Food-plant wild cockscomb. Pupated July 29, imago Aug. 4. These three species are all, I believe, now first recorded from Jamaica.

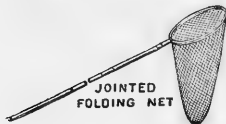
T. D. A. Cockerell.

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PSYCHE.

ON THE OCCURRENCE OF *DISSOSTEIRA LONGIPENNIS* THOMAS.

BY S. J. HUNTER.

Department of Entomology, University of Kansas, Lawrence.

Professor L. Bruner, in his report to the Nebraska State Board of Agriculture for 1896, says that though *Dissosteira longipennis* has been known to entomologists for twenty-five years, it has been classed among our rarer Acrididae until 1891. At this time he was called upon to investigate its habits in eastern Colorado, where it had appeared in large numbers. He afterwards speaks of its habitat, and here we quote his language.* "It is rather restricted in its normal range, being found only upon the plains of western Nebraska, Kansas, southeastern Wyoming, eastern Colorado, and northeastern New Mexico, at an elevation of from 3,500 to 6,000 feet above sea level. It is also known to occur, for the most part, upon the gravelly slopes where vegetation is quite sparse." Continuing his report to the State Board of Agriculture, he states that the insect has found its way eastward almost to the Missouri river in Kansas and Nebraska.

In the field work of this department during the past summer, the writer had occasion to give special attention to grasshoppers. *Dissosteira longipennis* was occasionally seen in the territory under observation, being in all thirteen counties situated between the 99th meridian and the west line of the State. In Edwards county, six miles south of Offerlie, however, this locust was abundant in a portion of an alfalfa field of 320 acres. In bare spots, where no alfalfa grew, more than a dozen insects would take wing when disturbed and fly in different directions for a short distance. This was observed first on July 6th. On September 1st females of this species were seen ovipositing in this field. It is the writer's opinion that this colony was bred and reared upon this ground.

In the latter part of September, 1897, the writer captured a single female three miles south of Lawrence in a closely grazed pasture. In August, 1898, a student of this department took two females upon the university campus. On September 24th of this year the

* Report to Riley, under whose instructions investigations were made. Bulletin No. 28, Div. Ent. U. S. Dept. Agric., pp. 36-39.

writer found another specimen six miles west of Lawrence in a strawberry patch on a high hill overlooking Lake View.

In a letter upon this subject, Mr. S. H. Scudder gives references to the capture of *Dissosteira longipennis*, in Texas (Boll), in Nebraska, "entire state" (Bruner), in extreme western Kansas (Osborn), Barber Co., Kansas (Bruner). He says farther: "I have 34 refer-

ences to it in literature, but in none do I find a reference to its capture as far east as Lawrence," and thinks it improbable that it has been reported as taken this far east.

These notes are given in evidence of what may be considered an eastward tendency in the geographical range of this insect.

NOTES ON NEW ENGLAND ACRIDIIDAE, IV, — ACRIDIINAE. — V.

BY ALBERT P. MORSE, WELLESLEY, MASS.

41. *Melanoplus extremus* Walk.

Figs. 41, a.

Caloptenus extremus. Walker, Cat. Dermapt. Salt. Brit. Mus., IV, 681, (1870); Thomas, Syn. Acrid., 225.

Melanoplus junius. Morse, List, 106.

" *extremus*. Scudder, Rev. Melanopli, 287, pl. xviii, fig. 10.

Measurements from 62 ♂, 82 ♀:— Antenna: ♂, 7.5-9; ♀, 6-8. H. fem.: ♂, 9.4-11.2; ♀, 10-12.6. Teg.: ♂, 9.5-16; ♀, 10-18. Body: ♂, 15-19; ♀, 15.5-24. Total: ♂, 15-22; ♀, 16-24. Teg. vs. H. fem.: ♂, -3 to +3; ♀, -4 to +3.

A very variable species. In the fresh state its general coloring—a peculiar olive with blackish markings—is very appreciable and of service in recognizing it, though the long-winged female is liable to be mistaken for *femur-ru-*

brum. While tegmina of every length between the extremes given are to be found, most of the specimens observed fall into two series, a short- and a long-winged. In the former the tegmina usually fall about 2 mm. short of the end of the hind femora; in the latter pass them by 2 or 3 mm.;—the names *junius* and *scandens* respectively have been applied to these by Scudder. Of the specimens now in my collection (a number having been disposed of through exchanges) about one-eighth of the females and two-thirds of the males are long-winged (*scandens*). The long-winged form seems to be more prevalent in high latitudes and at high elevations. In point of size also the species varies much according to locality, specimens from Winchendon, Mass., (800-1200 ft.) being noticeably larger than those from the summit of Mt.

Greylock (3500 ft.); but Arctic American specimens are said by Scudder to be distinctly larger than those from New England or Nebraska. The color of the hind tibiae is very variable; these are normally red, either deep or pale in tint, yet in many males are luteous or even greenish. In this particular also specimens vary according to locality.

It makes its appearance early, reaching maturity in late June or early July, and in the White Mountain region is not uncommon in early September. Like its ally *femur-rubrum*, it is partial to damp or moist surroundings and I have found it most common in the thick, succulent growth of grass in meadows and springy fields. Blatchley found it in an open peat-bog in Indiana.

I have taken it at Norway, Me., No. Conway, Jackson, and the summit of Mt. Washington, N. H.; Hyde Park, Jay, Montgomery, Newport, Troy, Woodstock, and on Ascutney Mt., Vt.; Mt. Greylock and Winchendon, Mass., and have received it from Hudson, Me. (F. P. Briggs).

42. *Melanoplus minor* Scudd.

Figs. 42, a.

Caloptenus minor. Scudder, Proc. Boston Soc. Nat. Hist., XVII, 478 (1875).

Melanoplus minor. Morse, List, 106; Beutenmüller, Orth. N. Y., 307; Scudder, Rev. Melanopli, 337, pl. xxii, fig. 9.

Measurements from 223 ♂, 145 ♀:

— Antenna: ♂, 6.7-7.5; ♀, 7-8. H. fem.: ♂, 10-11; ♀, 12-13.5. Teg.: ♂, 11-15 (average 12-13); ♀, 13.5-18. Body: ♂, 15-18.5; ♀, 19-24 mm.

The body about reaches the end of the hind femora; the tegmina are usually 1 to 2 mm., shorter, though one male has them extending 2 mm. beyond the femora.

The female of this species resembles most that of *collinus* from which it can be readily distinguished, however, by the form of the scoop of the upper valves of the ovipositor. The hind tibiae are very variable, ranging from cherry-red to greenish or blue. Red tibiae are more common among the females (25-33%, ♂ 17-20%); among the males, however, they are frequently glaucous at base and pinkish at tip.

This is the earliest member of the genus to appear in spring, adults having been taken June 7. By the 20th or 25th of the month, according to weather and lay of the land it is quite common and this is the best time to collect it in series, before the advent of the swarms of *atlanis*, *femur-rubrum* and *collinus* which shortly appear. I have taken examples as late as Aug. 20 but at that time they are very scarce and while they may be found in Sept. or later are not to be expected.

I have found it most numerous among sweet vernal and blue grasses (*Anthoxanthum odoratum*, *Poa pratensis*) in pastures and mowing-lands on gravelly or sandy upland soils. Its flight is seldom more than a few feet in length.

I have specimens from Fryeburg, Me., No. Conway and Jackson, N. H., Belmont (C. J. Maynard), Florence and Hadley (S. W. Denton), Adams, Blue Hill, Wellesley and many towns in its vicinity, New Braintree, Worcester and Winchendon, Mass., Thompson, Montville, Niantic, North Windham and Stamford, Ct.; and Woodstock. Vt.

43. *Melanoplus collinus* Scudd.

Figs. 43, a, b.

Melanoplus collinus. Scudder, Proc. Boston Soc. Nat. Hist., XIX, 284, (1878); Rev. Melanopli, 346, pl. xxiii, fig. 6; Fernald, Orth. N. E., 32; Morse, List, 106; Beutenmüller, Orth. N. Y., 306.

Measurements from 175 ♂, 148 ♀:—Antenna: ♂, 7-9; ♀, 7.5-9.5. H. fem.: ♂, 10-12.5; ♀, 11.5-15. Teg.: ♂, 10.7-16.5; ♀, 14-19. Body: ♂, 16.5-20; ♀, 19.5-27.5. Total: ♂, 16.5-22.5; ♀, 20.5-25.5 mm. The tegmina reach about to the end of the hind femora, varying 2 to 3 mm. either way.

This is one of our later-appearing species, reaching maturity in the latter part of July and being found until snow falls; I have taken it from July 30 to Nov. 17. It may be found almost anywhere, but is partial to open groves and the edges of woodlands made up of deciduous trees, especially on rather dry upland soil. I have specimens from Fryeburg, Norway, and Speckled

Mt., Stoneham, Me.; Hanover (C. M. Weed), Mt. Kearsarge (2000 ft.) and Pinkham Notch, N. H.; Wickford, R. I.; Canaan, Deep River, New Haven North Haven, Stamford, and Thompson, Ct., besides Dedham and Belmont (C. J. Maynard), Easthampton (S. W. Denton), Adams, Mt. Greylock (3500 ft.), Dover, Sherborn, Waltham, Wellesley, Provincetown, and West Chop, Martha's Vineyard, Mass.

44. *Melanoplus femoratus* Burm.

Fig. 44.

Caloptenus femoratus. Burmeister, Handb. Ent., II, 638 (1838).

Caloptenus bivittatus. Scudder, Mat., 465., Smith, Orth. Me., 150, Orth. Ct., 362; Thomas, Syn. Acrid., 166:

Acrydium flavovittatum. Harris, Treatise, 3rd ed., 173.

Melanoplus bivittatus. Beutenmüller, Orth. N. Y., 306.

Melanoplus bivittatus. var. *femoratus*. Morse, List, 106.

Melanoplus femoratus. Fernald, Orth. N. E., 32; Comstock, Introd., 110; Scudder, Rev. Melanopli, 360, pl. xxiv, fig. 4.

Measurements from 142 ♂, 100 ♀:—Antenna: ♂, 14-16; ♀, 9.6-14. H. fem.: ♂ 12.5-16.5; ♀, 15.5-22. Teg.: ♂, 16-22; ♀, 19.5-26; Body: ♂, 23-29; ♀, 29-40. Total: ♂, 23.5-31; ♀, 28-38. Teg. vs. H. fem.: ♂, -2 -+3; ♀, -4 -+3mm.

This is the largest member of the genus found in New England and is

readily recognized. Considerable individual variation in general color exists, there being three well-marked color-forms and all intergrades: 1st, olive-green shaded with brownish-fuscous; 2nd, olive-green shaded with lilaceous or rufous; 3rd, a bright, light greenish yellow. Of these the first is the most plentiful but typical examples of all three and any number of intergrades may be taken almost side by side. In dried specimens this difference of coloration is less noticeable, but the color may be retained in cabinet specimens by removing the contents of the body when first captured stuffing with cotton, and drying rapidly.

This species is common throughout New England, inhabiting both coast-wise marshes and the alpine summits of the White Mts. So widely distributed is it that a list of localities is needless. It makes its appearance late in June or early in July and is common during most of the season; I have taken it from June 27 to Sept. 20 and it could probably be found even later. It is most at home among the coarse grasses and weeds of moist meadows, springy runs and swamps, but is comparatively sluggish and easily captured.

45. *Melanoplus punctulatus* Scudd.

Figs. 45, a.

Caloptenus punctulatus Uhler Ms. Scudder, Materials, etc., in Boston Journ. Nat. Hist., VII, p. 465 (1862).

Smith, Orth. Me., 150; Thomas, Syn. Acrid., 163.

Melanoplus punctulatus. Fernald, Orth. N. E., 32; Morse, List, 106; Beutenmüller, Orth. N. Y., 307; Scudder, Rev. Melanopli, 374, pl. xxv, fig. 4.

Measurements from 13 ♂, 18 ♀: Antenna: ♂, 11-13; ♀, 10.5-12. H. fem.: ♂, 10-11; ♀, 11.3-12.7. Teg.: ♂, 14-16.8; ♀, 14.5-21.6. Body: ♂, 19-20.5; ♀, 23-29. Total: ♂, 20.5-25; ♀, 21.5-29 mm.

The male is readily recognized by the cerci, which though very variable resemble those of no other species found here save occasionally of *femoratus* from which size at once distinguishes it; the female may be readily recognized by the ovipositor.

This handsome locust, though widely distributed in the United States and not uncommon locally, is rare in collections, owing, no doubt, to its habits, which are more arboreal than those of our other species. Coniferous trees, especially pines, are its favorite haunts. In groves of these it may be found either on the ground or on the trunks and branches. I have taken it also in open grassy fields and even in a greenhouse. It is a sluggish insect, and a late-comer as well, adults appearing in late July or early August (my earliest capture is Aug. 2), and is found through September and October.

I have specimens from Sherborn (A. L. Babcock), Amherst (C. H. Fernald), Prospect Hill, Waltham (C. J. Maynard), and Wellesley, Mass.; and

Canaan, Ct. It has been reported to me from West Woodstock, Ct., (Beutenmüller), and is recorded from Maine and New Hampshire by Scudder.

26. *PAROXYA* Scudd.

Paroxya Scudder 1877. Proc. Boston Soc. Nat. Hist., XIX, pp. 28-29.

46. *Paroxya floridana*. Thom.

Caloptenus floridianus. Thomas, Bull. U. S. Geol. Surv. Terr., I, No. 2., p. 68, (1874).

Paroxya atlantica. Fernald, Orth. N. E., 34; Morse, List, 105; also Psyche, (1893), 401; Beutenmüller, Orth. N. Y., 305.

Paroxya floridana. Scudder, Rev. Melanoplus, 383; Sprague, Psyche (1896) 439.

Measurements from 82 ♂, 58 ♀;—Antenna: ♂, 13-15; ♀, 8.5-11. H. fem.: ♂, 12-13.5; ♀, 15.3-18.7. Teg.: ♂, 13-16; ♀, 14.5-20. Body: ♂, 20-25; ♀, 26-36. The hind femora usually pass the tegmina by 1 or 2 mm. in the male and 2 or 3 in the female.

The only variation of note is the occurrence of a striking melanistic form,

at least in the male, several examples of which I secured at Faneuil, Mass., some years ago.

This is a relatively slender-bodied locust of medium size and graceful and elegant appearance which should be readily recognized when captured. It occurs locally in swamps and marshes in southern New England, where I have taken it on cord-grass (*Spartina*) growing in the tide-water ditches of salt meadows and in the long sedge of bushy inland meadows and swamps. It is usually numerous but not abundant where found. While active and alert it is readily captured owing to its habit of trying to escape observation by getting out of sight behind the stouter stems of grass and weeds rather than by flight, to which it resorts only when alarmed. It leaps well and quickly, but its flight is comparatively short.

In New England it has been taken from July 22 to Aug. 30 at Cambridge, Faneuil, Newtonville, and Walpole, Mass.; Deep River, North Haven, Niantic, and Stamford, Ct. Immature specimens were plentiful at Faneuil on the earlier date.

ENTOMOLOGICAL EXPEDITIONS.—Mr. R. E. Snodgrass, assistant in entomology in Leland Stanford Jr University, sailed from San Francisco on Nov. 1, for the Galapagos Islands. Mr. Snodgrass will spend six months on the islands collecting insects and other animals for the entomological and zoölogical departments of the University. Mr. Snodgrass is accompanied by Mr. Edmund Heller, student in the department of

zoölogy of Leland Stanford Jr University.

C. F. Baker left Auburn, Ala., on Nov. 1st, 1898. He has gone on a two years' leave of absence from the Polytechnic Institute, as field botanist to the Herbert H. Smith exploring expedition, which will be engaged in biological work in northwestern South America. All letters and packages for him should be addressed to St. Croix Falls, Polk Co., Wisconsin.

A NEW ANT-NEST COCCID.

BY GEO. B. KING AND J. D. TINSLEY.

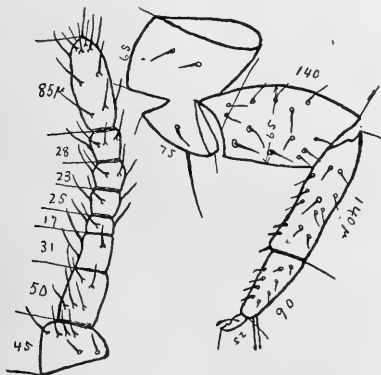
Dactylopius cockerelli, n. sp.—Adult ♀. Length $2\frac{1}{2}$ mm. Width $1\frac{1}{3}$ mm. Shape, ovoidal, quite plump. Color, reddish varying to brownish. Coated with white mealy secretion. With a hand lens the segments of the body are quite distinct. No lateral or caudal appendages. Boiled in caustic potash the insects do not stain the liquid. Shortly after boiling however the insect changes to a deep reddish brown color. Cleared and mounted, the skin is colorless,

large hairs. Mouth parts very small, rostral loop not reaching half way to base of middle legs. Legs quite stout, short and bristly; femur and tibia nearly equal in length, the femur being a little the longest, and quite stout, $140\ \mu$ long $65\ \mu$ wide. Tibia $120\ \mu$ long. Tarsus short, less than $\frac{1}{2}$ the length of tibia, $60\ \mu$ long. Claws stout and curved, $20\ \mu$ long. Tarsal digitules very fine and quite short. Claw digitules short, knobbed and quite indistinct. Anal ring with the usual 6 hairs. Caudal tubercles normal, each with a long hair ($\frac{1}{2}$ longer than those of the anal ring) and one much shorter hair; there are also a long conical spine and other short spines. The skin has a few scattering long hairs and conical spines more noticeable between the antennae and some more on the margin and numerous gland spots.

Habitat. Andover, Mass., Sept. 17, 1898, in nests of *Lasius flavus* L. under a flat stone. The coccids are concealed in a small snow white cottony ovisack, composed of a fluffy mass of cottony secretion 4 mm. long and $1\frac{1}{3}$ mm. wide. At the anal end of the sack are found the small oval bright pink eggs of the coccid. This is the 9th ant-nest coccid found in Massachusetts, and it should be stated here that *Dactylapina citri* Boisd. and *D.*

adonidum L. have also been found in ant nests in Mass.

This species is probably most nearly allied to *Dactylapinus kingii* Ckll. from which it differs in having the antennae and legs stouter; in *kingii* the 1st joint of the antennae is always longer than the 2d, while in this species the 2d is usually longer than the 1st although they may be subequal. The femur of *kingii* is considerably longer usu-



Dactylopius cockerelli.
Antenna and leg, $\times 200$.

Antennae, legs and mouth parts light yellow after mounting. Antennae 8 jointed, 8 longest and thicker than 5×6 or 7 and as long as those three joints together. 2 always longer than 1: three next longest, then 7×5 and 6 with the 4 shortest. Formula 8213754. There is little difference between the joints from 4 to 7 except that 4 is distinctly shorter, joints 1×2 are nearly as long again as 6 and 7. All of the joints have numerous rather

ally 180-225 μ and being of about the same width 165 μ the femur appears more slender. The ovisac of *kingii* is also not so compact as in this species. The drawings are by Prof. Tinsley who is also responsible for the comparison with allied species.

SECOND NOTE ON A NEW HEMI-LEUCA.

Hemileuca sororia race *oliviae*, Ckll., Psyche, 1898, p. 252. ♂. (Sta. Fé. N. M.) On Aug. 20, 1898, Mr. John Davis sent me some larvae collected at Maxwell City, N. M., stating that they were then extremely numerous, and were devouring the pastures. With the larvae were sent pieces of grass, which Prof. E. O. Wootton identifies as a *Muhlenbergia* probably *M. texana* Thurb. (*porteri* Scrib.). From these larvae I bred four moths of *oliviae*, which was only known heretofore by a single ♂! A male emerged Sept. 13, two males Sept. 14 and a female Sept. 15.

Larva. Of the living larva, I noted as follows:—Ochreous with a very dark brown head; body irregularly marbled with very dark brown, especially about the sutures; tufts of spines as usual in the genus, the central ones black, the lateral ones (*spinules*) ochreous with black tips; thoracic legs black.

The skin is sparsely beset with colorless hairs. Spiracles narrowly edged with black.

Cocoon. The cocoon is composed mainly of fragments of the *Muhlenbergia* loosely woven, with many open spaces.

Imago. The males agree in the main with the Santa Fé type, but are perhaps, a little grayer. The female expands 65 mm., and has a warmer, more rosy color than the males. The general color of the anterior wings is nearly uniform, with the two pale bands distinct.

Compared with the description of *H. sororia* Hy. Edw., the ♀ *oliviae* differs thus:—Costa of primaries orange-ferruginous

throughout; secondaries above with the nervures pale ferruginous; on the under side the nervures are pale ferruginous on all the wings, and the costa of the primaries is broadly orange ferruginous, subfuscous at base. that of the secondaries washed with blackish; head clothed with dark fuscous hair, gray on vertex and occiput; thorax with dense long gray hairs; antennae entirely bright orange; abdomen above with fuscous hair, chestnut on the first two segments; hind margins of third to fifth segments with red hair, which is replaced by white on the extreme sides, and beneath except in the middle; apex with mixed fuscous, white and red hair. The expanse is 11 mm. less than that of *sororia*.

H. oliviae is of about the same size as *H. sororia hualapai* (Neumoegen), from S. W. Arizona, but differs in the markings. The three forms, *sororia*, *hualapai* and *oliviae* are clearly geographical races of a single well marked species.

In the Mesilla Valley, N. M., I have never taken *H. oliviae*, but only *H. maia* race *artemis* (Pack) and *H. juno* Pack., the former being much the most frequent.

T. D. A. Cockerell.

N. M. Agr. Exp. Sta.

A CURIOUS COCOON OF ATTACUS CECROPIA. — In September last I found a very large larva of *Cecropia* feeding on willow in a swampy place. I took it home and it began its cocoon the next day, in a white paper box, from which I removed all leaves. The cocoon was glistening white at first, and in this state was packed with white cotton for transportation from Vermont to Brookline. The box was unopened for a month, and when the cocoon was taken out it was nearly all green, the small spaces not green being just off white. The pupa seems to be in good condition and is evidently alive.

Caroline G. Soule.

Brookline, Oct. 15.

DISSOSTEIRA IN COLORADO.

ON THE evening of July 21, this year, locusts came from the west down into Colorado Springs in countless numbers. Press reports stated "at some places they were in piles from seven to ten inches deep." Electric lights were not used for several evenings afterward to avoid attracting those passing over. Specimens sent by Board of Commerce of Colorado Springs to this department showed the invading species to be *Dissosteira longipennis*. Engineers running from Limon, Col., to Goodland, Kans., told the writer that night trains encountered locusts in great numbers on the tracks in the vicinity of Arriba, Col., from July 23d to 26th. It seemed evident that the rails by retaining heat longer at night than the earth attracted the insects. From the numbers of *Dissosteira longipennis* found about the engines coming into Goodland in the morning from the west, it is safe to say that the above was the predominant species.

S. J. Hunter.

University of Kansas.

CALLIDRYAS EUBULE has been flying in Nonquitt, Mass., in September. The butterflies were too numerous and too fresh to be strays, and must have been there as larvae.

Caroline G. Soule.

Brookline, Oct. 15.

PROCEEDINGS OF THE CLUB.

14 OCTOBER, 1898. The 203d meeting of the Club was held at 156 Brattle St., the President in the chair; Mr. J. W. Folsom was chosen secretary pro tem.

Mr. A. M. Mayer gave an interesting account of the Dry Tortugas, where he had spent the summer, and exhibited a small collection of insects which he had captured upon the islands, where insects are comparatively scarce. *Hevaclides crespontes*, *Callidryas eubule* and *Anosia plexippus* occur

as visitors only, as well as several Cuban moths; most of these are brought to the islands by northeast or south winds. A sphingid larva allied to *Deilephila* was seen, a single species of cricket and certain small Odonata. A Carabid occurs, often in enormous swarms, and *Schistocerca americana* is abundant. A small, green mantis is said to occur every year.

The distribution and habits of these insects were discussed.

Mr. S. H. Scudder showed a large series of *Melanopli*, representing new species which had appeared since his Revision was written. A large number belong to the genus *Melanoplus* alone; fourteen were taken in California and Oregon by Mr. A. P. Morse and several in Colorado by Mr. C. F. Baker; others are from Arizona. Three peculiar and closely allied species come from Oregon and three more which are remarkably alike in the coloration of the hind femora but quite unlike in other respects were taken in the San Francisco Mts.

A paper was read for Mr. Geo. B. King, of Lawrence, Mass., who states that *Ripersia lasii* Ckll. was discovered June, 1896, in various ant nests in Massachusetts. Since then much time has been spent in search of its food plant and without success until the 11th inst., when it was found feeding at the roots of China asters, attended by *Lasius americanus* Em. Nearly all the plants in the bed were found to have a herd of these Coccids attached to their roots and in every instance the ant was present with them. There were also found, on some of the roots, three species of Aphids, usually found in ant nests in the vicinity of Lawrence: *Aphis maidi-radicis*, *Schizoneura corni* and *Pemphigus* sp. The paper will appear in PSYCHE.

Mr. Scudder read extracts from letters which he had received; Mr. James H. Johnson, of Peterboro, N. H., reports the occurrence of *Eucroma maia* upon *Spiraea silicifolia*, or "hardhack"; also the capture, by himself,

of a single specimen of *Eurymus interior* at Charlestown, N. H., May 1, 1892. This locality is noteworthy as the insect has hitherto been recorded from New England only in the northern parts of New Hampshire, Vermont, and Maine.

Mr. S. J. Hunter, of Lawrence, Kansas, writes that he has collected *Dissosteira longipennis* in countries west of the 99th meridian. One specimen, however, was seen in Leavenworth County in the fall of 1897, two were taken in August and another in September of the present year. (See another page).

Mr. Scudder further said that by the courtesy of Miss Gibbes he had been permitted to see a few notes on butterflies made by the late Prof. Lewis R. Gibbes at Charleston, S. C. As an indication of the rarity there of *Euvanessa antiopa*, it is noted that he had seen but two specimens, one taken in April, 1879, in Magnolia Cemetery, the other reared May 2, 1874, after sixteen days in chrysalis. *Callidryas cubule* was reared Oct. 3 after ten days in chrysalis; and a larva "probably of *Pyrameis atalanta*" (but which from his brief description may as likely be *cardui*) was taken June 8, 1874, on *Aesculus parviflora*, a new food plant (even to the family—*Sapindaceae*) for either *atalanta* or *cardui*.

Mr. A. N. Caudell said that he had seen a few examples of *Euvanessa antiopa* in Oklahoma in the fall of 1897.

Mr. Mayer remarked upon an item in a daily paper concerning a migration of butterflies observed in Wichita, Kansas. The swarm

consisted principally of *A. plexippus*, and *P. ajax*. Some discussion followed upon the subject.

Mr. J. W. Folsom exhibited drawings of Japanese Collembola which he had recently studied through the kindness of Prof. Packard. The collection was made by Prof. C. Ishikawa, of Tokyo, and comprises eleven species, of which six species and one variety are new. Comparisons between the Collembola of Japan and those of other countries were given.

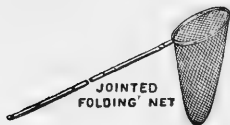
Mr. A. P. Morse reported the serious devastations caused by *Citsiocampa distria* in Woodstock, Vt., during the last summer. Maples, birches and apple-trees, especially, were badly defoliated and were frequently stripped and killed. No trees were exempt from attack except the black-walnut and certain conifers. As the attacks are yearly increasing in severity, the outlook for next year is alarming.

The habits and parasites of the insect were discussed.

Mr. W. L. Tower gave some results of his studies upon a large series of *Pieris rapae*, collected at high altitudes in Colorado. The butterfly is known to breed at an altitude of 9,500 feet and occurs as high as 12,000 feet. Mr. Tower's series, collected by Mr. E. J. Osler, shows a gradual diminution in size and a tendency to albinism in proportion to the altitude.

The subject of albinism and melanism was then considered by the members.

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J. T. HATHAWAY,
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PSYCHE.

THE MOUTH PARTS OF THE NEMATOCEROUS DIPTERA,—I.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIFORNIA.

The repeated attacking of the problem of the homologies of the mouthparts of the Diptera will result in giving us, sometime, a solution. The problem is not inherently insoluble. It is to be solved as other problems in homology have been solved and are daily being solved, namely, by a study of the comparative anatomy and a study of the ontogeny or development of the organ or organs in question. But any such study of homology has inevitably to do with more than the mere determination of homologies: it is inevitably a study of phylogeny.

There are two phases of the work of the student of phylogeny: comparative anatomical study and ontogenetic or developmental study. The study of comparative anatomy includes not only the study of the living members of the group in hand, but also the study of the extinct members, the paleontologic phase. As any organism is simply the sum of its organs, it follows that the phyletic study of a group of organisms resolves itself into a phyletic study of the body organs, and the phylogeny of any one of these organs, fully and

correctly worked out, is a great step toward revealing the phylogeny of the group of organisms. For the descent of an organ is synchronous with the descent of an organism.

The determination of the homologies of an organ or group of organs throughout a group of organisms involves the discovery of the primitive, racial, most generalized condition of the organ in the group, and then the various kinds of specialization the organ exhibits, and the paths from generalized to specialized condition for each of these kinds of specialization. This is no more nor less than true phyletic study.

The problem presented us, then, in the homologies of the dipterous mouthparts, so often attacked and in such various ways, seems to me plainly a phyletic problem, and to be solved most expeditiously, if not only, by the rational and accepted methods of systematized phylogenetic investigation. The comparative anatomy of the mouthparts of the living flies (the paleontologic phase of the work is in this case impossible), is to be studied with the aim of determining what is the most generalized

condition of these organs and what the specialized conditions (for because descent is not linear but branching, it is illogical to speak of the most specialized condition; it is wholly possible for several equally "most specialized" conditions to obtain, each the apex of its own kind of specialization [line of descent]). Then are to be determined the lines or tendencies of specialization, and the intermediate conditions are to be arranged along these lines. After the provisional determination of the homologies and phylogeny of the mouthparts by the study of their comparative anatomy, the development or ontogeny of the mouthparts of various flies is to be studied, also with the aim of determining the generalized mouthparts condition and the paths of specialization. The results of the two methods of study should be mutually confirmatory, if a correct interpretation of each is reached.

Of course the two methods of study may, and often are, advantageously carried on more or less nearly simultaneously, the revelations of one phase helping materially to the quicker understanding of the phenomena of the other. Or the ontogenetic study may precede the comparative anatomical. Unfortunately, in practice usually but one phase of the study is prosecuted by a single investigator, limitations of time, or material, or of the capacity of the student restraining him from the full double-phased undertaking.

Having begun the study of the dip-

terous mouthparts some time ago, I have progressed sufficiently to learn (*a*) that the comparative anatomy of the mouthparts is not an especially difficult study, but that it alone may not certainly determine the homologies of the dip-terous mouth, and (*b*) that the ontogenetic study of the mouthparts of Diptera is an especially difficult study.

The Diptera exhibit "complete metamorphosis" in their life history. So thoroughgoing is this metamorphosis, as proved by the studies of Weissman, d'Herculais, Viallanes, Kowalevsky, Van Rees *et al*, on the post embryonal development of *Musca*, that the beginnings of almost all the imaginal organs are to be looked for in the late larval stages of life. The extraordinary histolysis which is suffered by most of the larval tissues and organs is so far-reaching that most of the imaginal organs develop from small groups of undifferentiated cells, the imaginal buds or histoblasts, which do not begin active development until the fly has reached and spent some time in, its larval stage. This is conspicuously true of the integument and the appendages of the head and thorax; the wings, legs, and the imaginal mouthparts arise from histoblasts whose development from groups of invaginated hypodermal cells into imaginal organs begins only rather late in larval life. The difficulties of the study of the development of the imaginal appendages, and particularly of the mouthparts, is difficult. The development, beginning late, proceeds with

great rapidity: it is obscured by the histolysis of the larval mouthparts going on at the same time with the histogenesis of the imaginal organs, and because there is a marked acceleration of development, by which some of the phyletic stages are crowded together, or perhaps crowded entirely out. So serious are the difficulties in the study of the post-embryonal development of insects with complete metamorphosis, that, although thirty-five years have elapsed since Weissman's first enlightening study of *Musca*, and although the interest and importance of the study are fully recognized by zoologists and entomologists, only a scant dozen investigations have been at all successfully prosecuted, and our present knowledge of the subject is based on five or six papers on *Musca*, a couple of studies on *Lepidoptera*, one on a *Hymenopteron* and one on a *Colopteron*. Most of these papers attempt to trace the development of only certain organs, and in only one of the papers is there an attempt to describe the development of the mouthparts. Künckel d'Herculais in 1875 discovered and briefly described the histoblasts of the imaginal mouthparts of *Musca*. The course of the development, in any such detail as really to throw light upon the homologies or phylogeny of the Dipterous mouthparts, has yet to be traced.

The other phase, the comparative anatomical phase, of the study of the mouthparts of the *Diptera* has been far more successfully attacked. Exhaustive accounts of the morphology of the

mouthparts of one or of a few species as presented by Kraepelin, Dimmock and others, and comparative studies of the mouthparts of many genera and families, as presented by Becher, Smith, Menzbier, Meinert, and others, combine to make up a large literature on the subject. Most of these papers make the mistake (as it seems to me) of devoting attention largely to a consideration of the more specialized condition of the mouthparts as presented by the brachycerous families, and of attempting to interpret homologies by comparing these conditions with the specialized mouthparts of other highly organized insects, as the *Hymenoptera*. There seems to be no systematic and thorough search for the most generalized condition of dipterous mouthparts, no attempt to discover the lines of specialization; the studies seem to be little guided by, and take little advantage of, the methods of phyletic study. We know much more about the mouthparts of the *Muscidae* than of any one of half a dozen of the *nematocerous* families. And yet entomologists and dipterologists call the *Nematocera* the generalized *Diptera*.

The notes I have first to present are simply a contribution to our knowledge of the comparative anatomy of the mouthparts of the *nematocerous* families of the *Diptera*. Excepting the *Ornephilidae* (represented in America by a single, rare and to me so far unobtainable species) I have studied the mouthparts of all of these families. The general condition

of the mouthparts in all of these families is much alike and not difficult to understand. The homologous parts in the mouths of the various Nematocera are readily distinguishable and comparable. These mouthparts as compared with the mouthparts of the specialized Diptera, *Musca* for example, are distinctly generalized. Now if the parts of the specialized dipterous mouth, as that of *Musca*, can be homologized with the parts of the generalized mouth, as presented by the Nematocera, then the remaining problem is to homologize the mouthparts of the Nematocera with the mouthparts of other insects, with the racial orthopterous type of mouthparts.

In order that the testimony from the

study of comparative anatomy alone may be sufficient to solve our problem it is necessary that (*a*) there be a series of gradatory mouthpart conditions present among Diptera sufficiently continuous to indicate unmistakably the homologies of the mouthparts within the order, and (*b*) that the generalized dipterous mouthparts be sufficiently generalized to admit of a certain comparison and homologizing of the parts with the mouthparts of other insects in whose case the homologies of the mouthparts with those of the racial orthopterous type are authoritatively accepted. Whether these conditions obtain may be, I hope, revealed by the final publication of my studies.

AN UNKNOWN TRACT ON AMERICAN INSECTS BY THOMAS SAY.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

In the library of the Boston Society of Natural History, among the works received from the library of Dr. T. W. Harris, is a tract which seems to have escaped the notice of bibliographers and others. Strangely, it does not even appear in the Catalogue of the Harris Library, (*Proc. Bost. soc. nat. hist.*, vii, 266-271), nor is it contained in the "Complete Writings" of Say, edited by LeConte. It is an octavo pamphlet of seventeen printed and numbered (3-19) pages besides the title page, the reverse of which is blank, and describes for the first time twenty-two insects; of these all but two are redescribed in later

papers in the same terms with scarcely a change. The remaining two, however, are not found at all in the Complete Writings and appear to be quite overlooked by subsequent writers, the Pentatoma being unmentioned by Uhler in his Check-list of the Hemiptera Heteroptera of North America (1886), and the Trypeta not being found in Osten Sacken's Catalogue of the described Diptera of North America (1878.)

The title page of the tract reads as follows: Descriptions of new species of North American insects, found in Louisiana by Joseph Barabino. By Thomas Say. March, 1831. Indiana. Printed

at the School Press, New Harmony. The species contained in it are the following; we have prefixed the number of the pages on which they occur, and appended the volume and page of the Complete Writings when found there.

- Page 3, Chlaenius circumcinctus, ii, 531.
 4-5, Oodes ? parallelus, ii, 532.
 5, Dytiscus bimarginatus, ii, 556.
 5-6, Noterus bicolor, ii, 561.
 6, Cupes cinerea, ii, 643.
 7, Hydrophilus castus, ii, 645-646.
 7-8, Trox alternatus, ii, 652-653.
 8-9, Tenebrio rufinasus, ii, 659.
 9, Oedemera apicalis [sic], ii, 660.
 9-10, Acanthocinus quadrigibbus, ii, 665.
 10, Altica mellicollis, ii, 668.
 11, Scymnus terminatus, ii, 671.
 11-12, Pentatoma maculiventris.
 12-13, Belostoma fluminea, i, 364-365.
 13, Belostoma grisea, i, 365.
 14, Corixia calva, i, 366.
 14-15, Formica mellea, ii, 731.
 15, Polistes metrica, ii, 768.
 16, Anthophora frontata, ii, 784-785.
 17, Megachile pollicaris [sic], ii, 782.
 18-19, Xylcopa carolina, Fabr., ii, 786-787.
 19, Trypeta trifasciata.

This tract is not to be confounded with the very similar Barabino pamphlet, published in the following year, describing nineteen species, although printed at the same press and evidently with the same type.

The descriptions of the two overlooked species are here carefully reproduced, with some notes regarding them kindly sent at my request by Mr. P. R. Uhler and Baron Osten Sacken.

[11.] PENTATOMA, Oliv. Latr.

P. maculiventris, Hemelytra with a line at

tip; venter with five series of black points. Inhab. U. S.

Body yellowish or pale brownish, with dense, rather large punctures: *thorax* acutely angulated each side behind the middle; *hemelytra* having an abbreviated fuscous line at tip of the membranous portion: *antennæ*, first joint short; 2d longer than the third: *tergum* on the lateral margin with a blackish dot on each incisure: *beneath* yellowish: *feet* immaculate; *thighs* sometimes having numerous minute blackish points; *anterior tibiæ* with an obvious spine over the slight emargination: *venter* with five obvious series of small black dots. [12.]

Length less than two-fifths of an inch.

This is a common insect in many parts of the Union. The anterior central angle of the venter is produced between the bases of the posterior feet as in *Acanthosoma* of Curtis; but it does not agree with that genus in the more essential characters of the antennæ and tarsi.

Mr. Uhler writes: Upon comparing the species of *Podisus* with the printed slip sent me, I find the description fits very well the *P. spinosus* Dallas. The description does not agree with any other of our North American species, as at present known. The humeral angles in *P. sericeiventris* Uhl. are not "acutely angulated," but they are in *P. spinosus*. — P. R. UHLER.

[19.] TYPETA, Meig.

T. trifasciata, Green; wings with three bands.

Inhab. Louisiana.

Body brassy-green, polished: *vertex* greenish: *front* pale ferruginous, pruinose: *antennæ* —: *hypostoma* dark livid, pruinose: *mouth* pale ferruginous: *stethidium* entirely brassy-greenish: wings yellow-white, a blackish band on the middle obsolete at the thinner

margin, and not including the smaller transverse nervure, but a little anterior to it; a broader and not quite parallel band midway to the tip, including the larger transverse nervure and an equally broad band at tip not arcuated: *tergum* purplish toward the tip: *poisers* pale yellowish: *feet* pale honey-yellow,

Length less than one-fifth of an inch.

Dr. Harris appends to this "*Ortalis acnea* Wied."

Baron Osten Sacken sends us the following note regarding this insect:—

Besides the *Trypeta trifasciata* Say, 1831, which you enquire about, there is an *Ortalis trifasciata* Say, Journ. Acad. Philad., vi, 184 (1830); Compl. Writ., ii, 368 (compare my Catal, 1878, p. 186).

This latter, according to Loew (l. c.) is a synonym of *Chaetopsis* (*Ortalis*) *acnea* Wied. But this synonymy can be accepted only if we read in Say's de-

scription "connected with the second band by the *posterior* margin," and not by the *costal* margin, as Say has it (Comp. his description with the figure of the wing in Monogr. N. Amer. Dipt. iii, tab. 9, fig. 19). Loew, l. c., iii, 171, line 10 from bottom, *has overlooked this discrepancy*. However, the species being very common, the synonymy is very probable.

The *Trypeta trifasciata* Say, New Harmony, 1831, from Louisiana, is evidently likewise a *Chaetopsis*, and *perhaps* the same as *C. debilis* Loew, Monogr., iii, 172, from Cuba. Compare the figure of the wing (l. c., fig. 20) with Say's statement "an equally broad band at tip, *not arcuated*." *Tryp. trifasciata* Say should therefore be placed *provisionally* after *debilis*, as a *possible* synonym, but with a query.—C. R. OSTEN SACKEN.

EARLY STAGES OF TRIPTOGON MODESTA.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

On July 13th, 1898, a battered specimen was brought me, found under an electric light in Brandon, Vt. At about 3 p. m. the moth began laying eggs and the following morning had laid eighty-four. On July 14 and 15 she began laying at about 3 p. m., and during these afternoons and nights laid thirty-two and sixteen eggs respectively.

These eggs were 2.5 mm. long and nearly 2 mm. wide at the widest part, ovoid, greenish gray—looking greener at night—and having a pearly lustre. On the second day they became heliotrope-color. On July 20th

they became greenish, showed the larvae distinctly, and the first-laid eggs hatched, giving an egg-period of barely seven days.

Young larva—length 7 mm., slender. Head round, pale green. Body very dark green, the dorsum looking as if undershot with black, except the last two segments which were pale green like the head. The body was rough, and had pale green subdorsal lines from the head to the tips of the anal props. These lines became yellow two days later. There were seven pale-green obliques rougher than the body. The legs

were pale green with red tips; the props pale green; the anal props prolonged at the tips behind, like those of *C. juglandis*. The caudal horn was bright carmine, short, straight, perpendicular, rough, and ending in a seta.

The larvae ate nearly all their egg-shells except a few, which ate only enough to let them crawl out. They were very active, began eating at once, and drank eagerly. They fed on *Populus balsamifera* var. *caudicans*.

July 24th. First molt. Length twelve mm. Head almost triangular, apple green with sparse yellow 'granulation' and with two larger granules at the apex. Face-lines yellow. Body dark green above with subdorsal lines and obliques of bright yellow granules, the last pair of obliques being wider and brighter than the others. On the front edge of the first segment and the rear edge of the second and third segments was a transverse line of larger yellow granules extending from one subdorsal line to the other and largest in the middle. These lines were very conspicuous. The venter was blue-green with whiter granules. Anal plate edged with yellow granules. The feet were red, legs and props blue-green with white granules. The horn was yellow with a dark carmine spot at its base in front, and the whole horn was rough with red granules.

The larvae ate all the cast skin except the mask and horn.

July 27th.—Second molt. Length eight mm. when in motion. When at rest the larvae were so bent over that they could not be accurately measured, the head being bent under the front part of the body.

The only changes in coloring were that the subdorsal lines were less distinct; the face lines yellower and broader; the horn was very short, and pinkish-yellow with a double dark brown dot at the base in front; there were dark brown spots on each leg, and on the anal props near the tips; the yellow granules of the transverse lines, on second

and third segments were almost spikes, recalling those on the dorsal line of *C. amyntor*. Molting required only twenty four hours.

July 30.—The legs had become yellow with red tips, and the yellow granules on the first segment were hardly noticeable. The striking points of the larvae were the rich velvety green color, the yellow crests of granules on the second and third segments, and the broad yellow obliques reaching from the substigmatal line to the tip of the caudal horn.

July 31st.—Third molt. Length twenty mm. Head pale green studded with pale yellow granules, and with face lines of brighter yellow granules meeting at the apex. First segment—pale green like the head, and granulated, but with no conspicuous crest of granules. Body—deep moss-green, densely set with tiny yellow granules, except the anal segment, which was bright yellow-green with small yellow granules, and the anal plate was edged with yellow granules and studded with glassy green ones, and had a dark red-brown spot at its tip. The second and third segments had conspicuous crests of yellow "spikes." The obliques were very narrow and of yellow granules, the last pair being broader and yellower. There was a broken substigmatal line of yellow granules from the third to the tenth segments. The legs were yellow with a dark red-brown spot, and red feet. Props were green granulated with yellow, the anal props having a dark brown spot at the tip. The horn was very short, rough, pale yellow. The spiracles were red, and noticeable for the first time.

Aug. 2d.—The larvae had lost the rich moss-green color, and become very blue green, while the golden-yellow marks had grown almost white. In this molt the larvae ate much more, and were quieter.

Aug. 5th. Fourth molt. Length four cm. Body largest at the tenth segment, tapering slightly to the head. Head very white-green

with white irrorations; face of a peculiar pink-purple color with pink face lines. Body—first segment very white-green, anal segment very yellow-green, the other segments very blue-green, all with white irrorations. The subsorsal lines had disappeared; and the obliques were of small white granules, except the last pair which were pinkish, broader, and rougher. The crests on the second and third segments were much less conspicuous, barely noticeable. Mouth parts, legs, and tips of prolegs pink-purple; a band of deep red-purple on the anal prolegs. Spiracles red purple in pink-purple spots. Anal shield heart-shaped, swelling, with the tip dark red-purple. Caudal horn very short, only 1 mm., slender, white, and rough. On the subsorsal line of ten segments was a spot of red-purple,—in some specimens. Others had but few spots. They varied from three spots, on each side of the body, to ten. These spots recalled the red spots of *S. myops*.

Some specimens sent to Miss Ida M. Eliot in Nonquitt, Mass., and fed on *populus tremuloides*, had no red-purple spots.

Aug. 13th.—The first one stopped eating while the last one hatched was molting for the third time, being much smaller and slower of development than any of the others. Length when full-fed 8 cm.

In the last molt the larvae ate voraciously and were very vigorous. In the first and second molts they were very delicate, and many died without any apparent cause.

These larvae are especially interesting because they omit the plain green, unmarked stage common to most sphingid larvae in the first molt, and because they show, in different stages, marks characteristic of three other species, yet are very different from all of them. I have seen no other sphingid eggs which undergo so many changes of color, or which have any color except green, becoming either yellowish or lead color just before hatching.

Aug. 19.—The first pupa cast the larva skin. The pupa was 4 cm. long, rather stout, with eyes and antennae well defined, and wing-covers short in proportion. Its color was green at first, then brown.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—I.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Aplodes mimosaria Guenée. This larva has been briefly described by Walsh and quoted in Packard's works. The description is not only brief, but erroneous, as the larva is entirely without "short velvety hairs" and has none of the structure of *Phobetron*, as is stated by Walsh.

The moths fly early in June, emerging from over-wintering pupae. There is a single annual generation, the six larval stages being slowly passed through, lasting from late June, when the eggs hatch, to September. Observations made on Long Island, N. Y.

Egg. Elliptical, very strongly flattened above and below, the edges sharp, the sides perpendicular, so that the eggs resemble biscuits. One end is depressed, the height being less at one end of the ellipse. Surface strongly reticular, the cell areas appearing almost like granules. Color bright orange, not shining; later red, and just before hatching sordid brown. Size $.75 \times .6 \times .4$ mm.

Stage I. Head rounded, smooth, pale brown, slightly streaked with darker; width about .3 mm. Body with a series of triangular subventral projections on joints 5 to 9, bearing setae iv and v which are remote,

normal. Feet normal for Geometridae. Color greenish brown, with faint, narrow dorsal and lateral brown lines, the latter expanding into spots at the projections; venter darkly shaded. Setae both on head and body short with swollen tips. Later the larva appears rather uniformly dark brown. The projections appear the whole length of the abdomen, but are largest centrally.

Stage II. Roughened; head round, a slight point at apex; width about .4 mm. Tubercles all rather large, especially on the cervical shield and joint 13; setae iv and v of joints 5 to 9 borne on prominent projections. Skin finely spinulose granular. Color yellowish brown, the projections darker, reddish; tubercles pale; all grizzled by the pale granules. Setae pale, short, pointed.

Stage III. More roughened; subventral processes forked (iv and v), sharp; also smaller lateral points anteriorly and posteriorly; a pair of prominent points on joint 2 and on joint 13 before the triangular anal plate. Head rounded, slightly bilobed; width about .6 mm. Color yellowish brown, densely covered with pale yellow granules, slightly mottled with dark red brown, especially in patches below the processes. Tubercles conic, high; setae short, stiff, white. No well defined markings.

Stage IV. Essentially the same. Head about .8 mm. Lateral projections of joints 5 to 9 flattened, furcate, the anterior limb longest, bearing tubercle v, excavate before, sloping behind; the spiracle borne on the dorsal aspect of the projection; tubercles iv and v conic, pale. Other points on joints 2 to 4 and 12 as before, scarcely any on joints 10 and 11. Color rusty brown dorsally, grayish ventrally, the ventral aspect of the

projections and a series of intersegmental dorsal marks dark brown; narrow, obscure dorsal and subdorsal lines, the latter distinct on joints 10 to 12. Skin densely pale granular.

Stage V. Head bilobed, roughened; width about 1.2 mm. Dead leaf brown, brighter dorsally posteriorly. Three dark brown, triangular marks on joints 5 to 7 anteriorly. Lateral processes obliquely streaked with brown and pale below, especially on joints 5 and 6, furcate as before. Tubercles, high; ii of joint 12 very high; many slightly produced tubercles on the thorax; setae small. Markings faint, but a pale dorsal line and a subdorsal and medio-ventral can be traced. Skin rough as before.

Stage VI. Head bilobed, the lobes slightly pointed, roughened granular, rusty brown; width 1.6 mm. Body granular, the tubercles prominent, single, normal. Lateral processes on joints 5 and 9 small, those of 6 to 8 large, furcate, bearing tubercles iv and v; four cones on the cervical shield; a subdorsal elevation with three cones on joints 3 and 4; a slight subventral prominence on joints 10 to 12; tubercles ii on joint 12 form long cones. All roughened granular; color dead leaf brown, a little variegated, being slightly grayish dorsally on joints 6 to 8 faintly brown lined longitudinally and with dark brown dots on joints 6 to 9 anteriorly and a bent white lateral line on joints 10 to 12. Spiracles dark ringed. The appearance is as in the previous stages. This stage lasted 30 days.

Food plant. Oak. The larvae are sluggish, solitary, and rest on the brown leaf where they have fed, their ragged appearance harmonizing with the mutilated and partly withered leaf.

SOME SYNONYMY.

APIIDAE.

(1.) *Melanostelis rubi* (Ckll.) = *Stelis rubi*, Ckll., Entom., July 1898, p. 167. n. syn. *Mel-*

anostelis betheli Ashm., Psyche, Nov. 1898, p. 283.

COCCIDAE.

(2.) *Pulvinaria pyriformis* Ckll., Jn.

Trinidad Field Nat. Club, 1894, p. 309. n. syn. *Pulvinaria newsteadi* Leonardi, Riv. Pat. Veget., 1898, p. 7 of separate.

(3.) *Aspidiotus trilobitiformis* Green, Ind. Mus. notes, 1896, p. 3 of separate. n. syn. *Aspidiotus darutyi* [daruyi= misprint] d'Emmerz de Charmoy, Revue Agricole, July 30, 1898, p. 2 of separate.

Segregates from Perdita.

I hardly know what to say about Mr. Ashmead's three new genera, established in Psyche, pp. 284-285, at the expense of *Perdita*. The palpal characters used to separate *Cockerellia* from *Perdita* are of no account, because Mr. Ashmead has overlooked the fact that Smith's type of *Perdita* had lost both pairs of palpi, the palpi in the figures being put in in dotted lines, purely from the imagination! It is quite certain, I think, that no *Perdita* ever had such labial palpi as Smith figures. Again, Mr. Ashmead says for *Cockerellia* "abdomen always banded or maculated," which is not usually the case in the males of the species he indicates as the type! The group of *Perdita albipennis* is a fairly compact section or perhaps subgenus, to which the name *Cockerellia* will apply, but I am reluctant to treat it as a genus.

Now as to *Phloxanthus*, the yellow color can hardly be generic, as yellow species occur in at least two distinct groups of *Perdita*. The claws are practically the same as in the group of *P. albipennis (hyalina)*, being in both cases simple.

Nomadopsis is equally doubtful. There are species showing all sorts of gradations in the length of the marginal cell; "maxillary palpi," in the description, should apparently be labial palpi.

A really good subgenus of *Perdita* for which I will propose the name *PERDITELLA*, contains *P. laneae* (type of subgenus), *marcialis* and *larrearum*. It has the stigma large; the marginal cell greatly reduced, with the substigmatal portion much the longest;

and the second submarginal very small and triangular.

I do not say that *Perdita* should not be divided into two or more genera; probably it will ultimately have to be split into half-a-dozen, but it will be necessary to proceed with caution.

T. D. A. Cockerell.

Mesilla Park, N. M.,

Nov. 5, 1898.

CHINA ASTERS INFESTED BY A COCCID.

Ripersia lasii Ckll. was discovered June, 1896, in various ant nests in Massachusetts. Since then much time has been spent in search for its food plant, and without success until now, Oct. 11th, when it was found feeding at the roots of china asters, attended by *Lasius americanus* Em. Nearly all of the plants in the bed were found to have a herd of these coccids attached to their roots, and in every instance the ant was present with them. I have thought all along that the *Ripersia* sp. found in ant nests would turn out to be subterranean. There was also found on some of the roots of Asters three species of *Aphids* usually found in ant nests in this locality. *Aphis maidi-radidis*, *Schizoneura corni*, and a *Pemphigus* sp. Several other plants were examined, but no coccids found to infest them. For the literature treating upon the genus *Ripersia* found in ant nests in Massachusetts see Canadian Entomologist, 1896, p. 222, same publication 1897, p. 92. Scieñce Gossip, vol. 3, Feb., 1897, p. 240, and Entomological News, 1897, pp. 125-129.

Geo. B. King.

Lawrence, Mass., Oct. 12, 1898.

CHANGE OF ADDRESS. Baron Osten Sacken requests us to announce that his residence has been changed to 8 Bunsen Strasse, Heidelberg, Germany.

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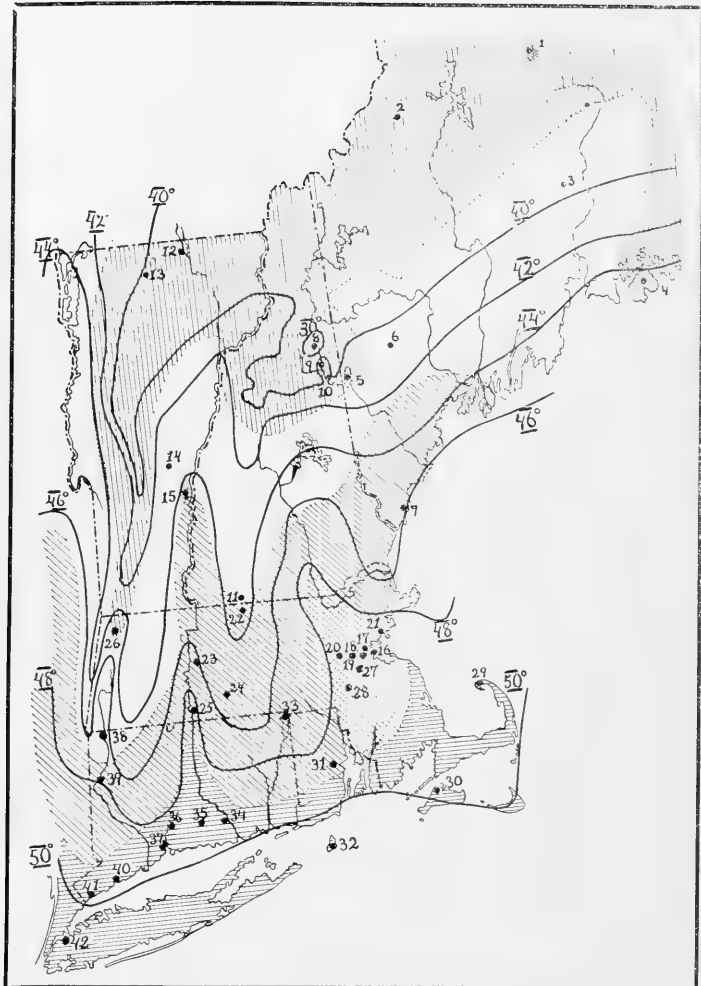
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Isothermal Lines and Faunal Areas of New England.

EXPLANATION OF PLATE 8.

Isotherms by W. M. Davis; Faunal Zones by S. H. Scudder—(from Scudder's Butterflies of the Northeastern States).

————— — Mean annual isotherms.

Vertical Ruling — Canadian fauna, restricted limits (= Boreal).

Unruled — Canadian fauna, ordinary limits (= Transition).

Oblique Ruling—Alleghanian fauna, ordinary limits (= Transition and Carolinian).

Horizontal Ruling — Alleghanian restricted (= Carolinian).

Oblique Broken Ruling—Dilute Carolinian locust fauna.

LOCALITIES.

- | | |
|----------------------------|------------------------------|
| 1. Mt. Ktaadn, Me. | 22. Winchendon, Mass. |
| 2. Jackman, Me. | 23. Amherst, Mass. |
| 3. Hudson, Me. | 24. Palmer, Mass. |
| 4. Mt. Desert Id., Me. | 25. Springfield, Mass. |
| 5. Fryeburg, Me. | 26. Greylock Mt., Mass. |
| 6. Norway, Me. | 27. Dedham, Mass. |
| 7. York, Me. | 28. Walpole, Mass. |
| 8. White Mountains, N. H. | 29. Provincetown, Mass. |
| 9. Jackson, N. H. | 30. Martha's Vineyard, Mass. |
| 10. North Conway, N. H. | 31. Wickford, R. I. |
| 11. Jaffrey, N. H. | 32. Block Id., R. I. |
| 12. Newport, Vt. | 33. Thompson, Ct. |
| 13. Montgomery, Vt. | 34. Deep River, Ct. |
| 14. Woodstock, Vt. | 35. No. Madison, Ct. |
| 15. Ascutney Mountain, Vt. | 36. No. Haven, Ct. |
| 16. Boston, Mass. | 37. New Haven, Ct. |
| 17. Cambridge, Mass. | 38. Canaan, Ct. |
| 18. Faneuil, Mass. | 39. So. Kent, Ct. |
| 19. Newtonville, Mass. | 40. Stamford, Ct. |
| 20. Wellesley, Mass. | 41. Greenwich, Ct. |
| 21. Lynn, Mass. | 42. Ravenswood, L. I. |

PSYCHE.

THE DISTRIBUTION OF THE NEW ENGLAND LOCUSTS.

BY ALBERT P. MORSE, WELLESLEY, MASS.

[Annual address of the retiring president of the Cambridge Entomological Club, January 13, 1899.]

The Acridiidae, short-horned grasshoppers or true locusts, are a family of insects of especial value for the study of geographical distribution, "life zones," and kindred topics,—probably more valuable than any other group of insects, and perhaps as important as the birds; they are, in consequence, deserving of more attention from biological surveys than they have yet received.

The reasons for ascribing to them so great value in connection with this subject are as follows:—They are terrestrial (as distinguished from aquatic) in all stages of their existence. They are almost universally distributed—with the exception of dense forests—from desert to jungle, from sea-side to mountain-top, from the arctic zone to the equator. They are conspicuous in size and habits—being from one-half inch to four inches in length, one inch to nine inches in expanse, diurnal, active and alert, flying or leaping freely when approached, often adorned with striking colors or producing loud sounds either in flight or at rest. They are voracious, their food being general in

character rather than special, a question of quantity rather than quality. They are numerous in individuals, whether local or widespread occurring in sufficient numbers to make it possible with reasonable effort to procure series sufficiently large to permit of critical study. They require a relatively small amount of care and delicacy of handling, making it possible to devote a proportionally large amount of time during field-work to the securing of material rather than to its preparation. Finally, while the majority are winged and active in habit they are, with few exceptions, relatively stationary during life, for not only is the range of individuals comparatively restricted but the same is true also of the range of a species in a given locality, which seems to be dependent less upon the presence or absence of particular food-plants than upon physical conditions often of extremely local character, such as the quality of the soil, exposure, drainage, humidity, etc. So true is this last statement that in a region where the locust fauna is fairly well-known, *e. g.*, New England, given

a field of any particular character it is possible to predict with a high degree of certainty what species of locusts will be found therein.

This susceptibility to local physical conditions is a very important attribute of the group in this connection. Most cultivated crops and many wild plants are equally susceptible to the same conditions,—a fact especially noticeable in parts of California where exposure to sea-wind or direct sun-rays produces a marked difference in the amount and character of the vegetation on contiguous hill-slopes, and also in parts of New England, where fields a few acres in extent are seldom homogeneous in character.

Now, the successful cultivation of crops by the individual agriculturist is dependent on the factor here involved: a close adaptation of a particular species or variety to its environment,—the environment being constituted by conditions, as has been said, often extremely local in character. For this reason it seems probable that close study of the distribution of this group of animals would prove of exceptional value in delimiting the smaller details of life zones, especially in the more valuable narrow extensions of such areas, whose importance has been indicated by Dr. Merriam.

It is perhaps worth while to point out in this connection that species belonging to a southern zone and adapted to a sandy soil may find their northern limit considerably higher up, both latitudinally and vertically, than other spe-

cies equally characteristic of the same zone but restricted to a damp and heavy soil. More rarely the reverse arrangement would occur. Consequently, that the final limit of a given zone would vary according to the species selected to delimit it and the adaptation of these species to the physical conditions of the locality in question.

So much by way of preface and in regard to details. It remains to be seen whether the distribution of the group is of value in determining the broader features of life zones. For this purpose let us turn our attention to a district sufficiently well-known to allow a comparison to be made. Such a district we have in New England, whose locust-fauna, with the exception of northern and eastern Maine and western Vermont, is as well known as that of any part of the Union of equal extent and whose faunal areas also have been the subject of study. While it is true that a great deal remains to be done in working out the details there is sufficient available to enable a close approximation to the truth to be secured.

Geographically considered the locusts of New England fall into three groups:—1st, species believed to be distributed over practically the entire district; 2nd, species known to be distributed over but a part of the district; 3rd, species whose distribution—either from local character or positive rarity—is insufficiently known. Of these groups the first is of interest in showing the relation of New England to the rest of the country; the third may be ignored for the present;

to the second we must look for the division of the district into faunal areas. If we include Long Island as a part of New England, which we may reasonably do, we have actual record of 48 species from this district. Of these 19 belong to the first group, 3 to the third, and 26 to the second.

The second group — those distributed over but a part of New England — falls naturally into two divisions, a boreal and an austral. The former, consisting of several species of boreal character, extends from the north over varying portions of the district; the latter, austral in character, extends similarly from the south over varying portions. These two divisions overlap each other widely, a consequence due in part to the general north and south trend of the more important physical features, — mountain chains, river valleys and sea-coast, — with its consequent effect on temperatures, but chiefly to other causes, particularly that of specific adaptability, as will be shown.

The northern division contains six species. The first of these, *Podisma glacialis*, is of a truly boreal and sub-alpine character, and is found more or less commonly in the vicinity of tree-line on the higher mountains of New England (Ktaadn, 1, White Mts., 8, Ascutney, 15, Greylock, 26, 3000 to 4500 ft.) and at a lower level in northern Maine (Jackman, 2).

Closely related to it in distribution and associated with it in several of the same stations is *Melanoplus mancus*, which seems, however, to be able to

withstand a higher temperature. This species has been found on Mt. Desert Id., 4, the White Mts., 1, Ascutney Mt., 15, and occurs, probably in an outlying colony, as far south as southern Connecticut, 34. This southward extension of its range is probably due to the influence of the ice-age.

These two species are apterous or sub-apterous and in consequence of their boreal character, are markedly discontinuous in distribution, except, possibly, in the extreme north. The remaining four are winged, in consequence are able to range more widely and occur, in the adult stage at least, on the alpine summits of the White Mts. as well as at lower levels.

Two of them prefer moist situations and apparently have much the same distribution. These are *Mecostethus gracilis* (Norway, Me., 6, White Mts., 8, and Jaffrey, 11, N. H., northern Vermont, 12, 13, Greylock Mt., 26, Mass.) and *Melanoplus extremus* (Hudson, 3, and Norway, 6, Me., White Mts., 8, Jackson, 9, and No. Conway, 10, N. H., Ascutney Mt., 15, Woodstock, 14, and northern Vermont, 12, 13, Mt. Greylock, 26, and Winchendon, 22, Mass.). The first of these is met by its congener, *lineatus*, which takes its place in southern New England.

The remaining two boreal species extend even further to the south, reaching northern Connecticut. These are *Circotettix verruculatus* and *Camnula pellucida*. The former frequents rocky ground and is met (or overlapped) at

Canaan, Ct., 38, by *Spharagemon saxatile*, a species having precisely similar habits which covers the southern part of New England. *C. verruculatus* occurs at Palmer, 24, Mass., and is recorded from Cambridge, 17, but seems not to be found there now, while *saxatile* is plentiful. *C. pellucida* reaches So. Kent, 39, in western and Thompson, 33, in northeastern Connecticut on high hills, outposts of the highlands of western and central Massachusetts.

So much for boreal species. Passing to the austral we find a group of three, *Tryxalis brevicornis*, *Clinocephalus elegans*, *Orphula olivacea*, occurring in swamps and salt-marshes in the vicinity of New York (Ravenswood, L. I., 42, Stamford, 40, and Greenwich, 41, Ct.) but perhaps extending further to the northeast. A fourth, *Schistocerca americana*, is found not infrequently about New York, and has been taken once near Boston. This is, however, an insect of exceptionally powerful flight and strong migratory tendency and is entirely adventitious in New England.

The remaining species inhabit a much larger portion of the district. *Schistocerca alutacea* is common in swamps in southern Connecticut and reaches Martha's Vineyard, 30. *Melanoplus scudderi* is found in western (So. Kent, 39), southern (New Haven 37), and southeastern (Deep River, 3†) Connecticut, and is reported from

Springfield, Mass., 25.* *Dichromorpha viridis* is common in all quarters of Connecticut, 33, 36, 38, 40, and at Amherst, 23, Mass., and is reported from New Hampshire which it probably reaches in the Connecticut valley. It is found at Wickford, 31, R. I., and probably throughout most of the State but is absent from the vicinity of Wellesley, 20, and Boston, 16. *Paroxya floridana*, common in southern Connecticut, reaches Boston, 18, and Cambridge, 17. *Scirtetica marmorata* is found in southern Connecticut, 36, on Martha's Vineyard, 30, and at Provincetown, 29, Mass. *Schistocerca rubiginosa* is found in northeastern Connecticut, 33, at Provincetown, 29, Dedham, 28, and Wellesley, 20, Mass. *Orphula maculipennis*, also common in northeastern Connecticut, is found along the coast at least as far as Lynn, 21, Mass., but for some reason is practically absent from the vicinity of Wellesley, 20. *Paratettix cucullatus* occurs in extreme northwestern, 38, southern, 37, and northeastern, 33, Connecticut and has been reported from the vicinity of Boston. *Arphia xanthoptera*, *Spharagemon saxatile*, and *Sph. collare scudderi* cover much or all of Connecticut, a large part of central Massachusetts, are common about Boston, and probably extend considerably farther to the north and east, probably reaching southwestern

Me. (Scudder, Rev. *Melanoplus*, p. 214) is erroneous, the specimen proving to be another species—*Melanoplus darwoni*, not previously known to occur in New England.

*The reported occurrence of this species in Brunswick,

Maine. *Pseudopomala brachyptera*, *Mecostethus lineatus*, *Melanoplus minor*, and *Orphula aequalis* extend even farther north, in most cases at least to Woodstock, 14, Vt., Jaffrey, 11, and No. Conway, 10, N. H., Fryeburg, 5, and Norway, 6, Me. The sole remaining species is noteworthy as illustrating in a high degree the peculiar susceptibility of many of the group to physiographical conditions, and its distribution may rightly be said to be almost as much physiographical as climatal. This is *Trimerotropis maritima*, the sea-side locust, which is restricted to the sandy sea-beaches of the coast from York, 7, Me., southward. The only exception known to me is that of a small colony at North Haven, 36, Ct., on the sandy plains of the old sea-floor, now a few miles inland but only a few feet above tidewater.

Examining the positive evidence given above in connection with the faunal and climatal map of New England in Scudder's Butterflies of the Northeastern States we find a remarkable conformity in the distribution of the locusts with the courses of the mean annual isotherms, a conformity most striking in the western, more inland, part of their courses. Compare, for instance, the southward extension into Massachusetts of the ranges of *Mecostethus gracilis* and *Melanoplus extremus* with the line of 44° , of *Circotettix verruculatus* and *Camnula pellucida* into Connecticut with the line of 46° ; the northward range of *Mecostethus lineatus*, *Melanoplus minor*, and

Orphula aequalis to that of 42° , of *Dichromorpha viridis* to the western part of 46° , of *Melanoplus scudderi* to the western part of 48° .

The distribution of the locusts is distinctly closer in agreement with the annual means than with the winter means; perhaps a little closer with them, on the whole, than with the faunal zones drawn from the distribution of the butterflies. I greatly regret to have been unable to compare it with the summer means or with lines based on the laws given by Dr. Merriam, viz.—that northward distribution is governed by the sum of positive temperatures for the entire season of growth and reproduction, and the southward distribution by the mean temperature of a brief period during the hottest part of the year.

Of course discrepancies occur. These are probably due, in part, to insufficient data, but may be due to other agencies, such as, *e. g.*, some unknown factor, or the difference between the annual mean temperatures and the factors stated above or to the possible conflict of these two factors between themselves, resulting in unconformable limits of two adjoining zones, distinguished by the overlapping or absence of characteristic species in certain sections.

As nearly as we can judge, however, from the data at hand, these limits are conformable in the case of the New England locusts except in eastern Massachusetts, where, also, the principal discrepancy with the isotherms is found, consisting in the absence from the

neighborhood of Boston and Wellesley, at least, of the austral species *Melanoplus scudderi* and *Dichromorpha viridis*, and the boreal species *Circotettix verruculatus* and *Camnula pellucida*.*

Notwithstanding discrepancies, to whatever agency due, it is clear that the distribution of locusts in New England is primarily and distinctly climatal in character, although strongly influenced by physiography and its attendant conditions.

The division of the district into faunal zones is apparently less distinct, but we may confidently recognize three,—first, a boreal or Canadian, closely following the restricted limits of that zone as laid down on Scudder's map, but even a little more restricted.†

This zone is characterised by the absence of the austral species and the

presence of the boreal, of which *Podisma glacialis* is the most characteristic. Its limits are most sharply marked in the White Mt. region in the vicinity of No. Conway. It covers the tops of the higher mountains in Massachusetts, Vermont, New Hampshire and Maine, a part of northern Vermont and New Hampshire, and the larger portion of northern Maine.

Second, an austral, upper austral, or Carolinian zone, characterized by the absence of typically boreal species and the presence of distinctly austral ones. This covers a large part of Connecticut, reaches Massachusetts in the Connecticut valley, and extends also into the southeastern part of that State.

Third, a transition or Alleghanian zone covering the territory not included by the other two and characterized by the overlapping of boreal and austral species. The line of demarcation between the transition and austral zones is most distinct in Connecticut, closely following the isotherm of 48°; it is less distinct in Massachusetts though probably all of the area southeast of this line in that state should be included in the Carolinian zone.*

* This is particularly interesting from the fact that both of the austral species are nearly or quite flightless,—*scudderi* entirely so, *viridis* except for a long-winged form of small numerical percentage,—and are usually plentiful in localities where they occur. Possibly they are to be regarded as recent invaders which have not yet reached their ultimate extension in New England. Of interest in this connection is the fact that while *viridis* at least is common in Rhode Island, both species are absent from Block Id. 32, and Martha's Vineyard, 30, where other flightless species are found (on the former: *Nemotettix cristatus*; on the latter: *Nom. cristatus*, *Pseudophomala brachyptera*, *Chloea conspersa*, *Melanoplus fasciatus*), all of them having a much more extensive northward range. Both *scudderi* and *viridis*, I am informed, are found on Long Id., a fact probably due to its proximity to shore. Otherwise, the island-fauna essentially agrees, so far as known, with that of the adjacent mainland, but it has been very little studied.

† It is possible that the passing of the winter in the egg stage in the ground may permit of a more general northward range of austral species among locusts than in some other groups.

* In support of this view there may be adduced the absence from the country around Wellesley and Boston of the two boreal species *C. verruculatus* and *C. pellucida*, which have the greatest southward range, and the presence of the austral species *Paroxya floridana*, *Hesperotettix brevipennis*, *Orphula maculipennis*, and *Schistocerca rubiginosa*. Here also the sassafras, chestnut, hickory nuts, and hazel nuts are plentiful, even the tupelo is common, and peaches, while not fully reliable, are in certain places, under careful management, an important crop. In view of these facts it would seem that this section should be regarded as an extension of the upper austral, carrying a dilute Carolinian fauna.

This area, however, is, a broad one of complex topography and has been but little studied except near Boston and Wellesley and on parts of Cape Cod.

While the larger part of the area of New England thus lies in the transition zone, the locusts inhabiting it are very largely austral in character.

Turning to the extra-limital distribution of the New England species we find strong conformation of the conclusions drawn from their intra-limital distribution, the two being closely parallel in character, each species having, with rare exception, the same zonal range extra-liminally as intra-liminally.

This isothermal or zonal distribution is very striking in a tabular arrangement where we find that by far the larger number of the species are distributed more or less widely over the upper austral and transition zones, chiefly in their eastern—Carolinian and Alleghanian—areas, a fact that would seem to indicate that the transition is essentially a part of the upper austral. A small number extend into three zones—the two above-mentioned and either the boreal or the lower austral, and a few cases occur of presence in four and of restriction to one.

Owing to the lack in many cases of enough, and of sufficiently accurate and definite, data it is impossible to speak otherwise than in very general terms, nor would time and space permit a discussion of details. And while it is true that the family has been studied and collected most in the transition and upper austral zones and that we have

relatively few data from the boreal and lower austral zones it is believed that subsequent study will tend to confirm rather than disprove the statements made above.

The distribution of a few species is of more than ordinary interest. *Melanoplus atlantis* has a remarkably wide range, from Nova Scotia to Beaufort, N. C., Winnipeg, Alberta, and Washington to Orizaba, Mex.; *Mel. fasciatus* ranges from Labrador and Newfoundland to New Jersey, Michigan to Missouri, Alberta and Washington to Colorado; *Paroxya floridana* from Boston, Mass., and Michigan to the Gulf of Mexico; *Orphula olivacea* from Stamford, Ct., and the Bermuda Ids. to Darien and Venezuela; *Tryxalis brevicornis* from Long Island to Honduras, St. Domingo and Brazil. *Hesperotettix brevipennis* has been found at Walpole and Wellesley, Mass., in New Jersey and Georgia, while of its numerous congeners none approach nearer than the Great Plains. *Trimerotropis maritima* is found along the Atlantic coast from Maine to Florida and occurs in a slightly differing form on the shore of several of the Great Lakes, a fact explained by and tending to confirm the theory of the previous existence of a southern connection—by way of the Mohawk and Hudson valleys—of the Great Lake basin with the Atlantic seaboard in the vicinity of New York City, a connection believed to have been open during the close of the glacial period.

Brief mention only may be made of the seasonal distribution. As stated

elsewhere (Psyche, viii, 164), the great majority of species pass the winter in the egg stage, hatch in the spring, and attain maturity in summer or early fall, being, in consequence, most numerous in the adult stage in August and September. This is the case with all of the Tryxalinae and Acridiinae and most of the Oedipodinae. Of the latter, however, three species (*Arphia sulphurea*, *Chortophaga viridifasciata*, *Hippiscus tuberculatus*) hatch in midsummer, pass the winter as nymphs, and reach maturity in April or May, flying until midsummer or rarely until September; these are all hardy species and reach a high latitude. The Tettiginae form a marked exception to the other groups in passing the winter as adults, being most numerous in September, October, April and May, and rare in midsummer; most of these, also, extend throughout the district. Immediately on the coast development is delayed from three to ten days in spring and the season is considerably prolonged in the fall.

The study of distribution would be greatly aided by the publication of local lists giving exact locality and date of capture, with such biological notes in reference to environment as careful and continued observation will secure. Very much might be done by local collectors in this way and it is to be hoped that more attention will be paid this group than heretofore. The most effective method of adding to our knowledge of the subject would be by making a series of transections of the isotherms at the proper season over portions of

the district to be investigated. By this means an experienced collector could secure a large amount of valuable data with a minimum of effort.

Some of the problems that should be borne in mind in connection with future observations are: the extent to which distribution, either local or general, is influenced by other factors than climate or temperature, such as food-plants, the necessity of a particular kind of soil or other substance for oviposition or as nidus for the eggs (rotten wood, pithy stems, etc.); the relative abundance locally of winged and wingless species; the relative abundance and width of range from year to year of each species, to determine whether it tends to increase or decrease in numbers and extent of habitat, to supplant others or be supplanted, — particularly, in New England, to determine whether *M. scudderi* and *D. viridis* are or not extending their range, etc.

To sum up:—Locust distribution is primarily and very distinctly climatal in character, habitats varying specifically in range but closely paralleling the isotherms. In its details it is influenced to a very high degree by physiography and its attendant conditions, such as character of the soil, humidity, etc. In its broader features it is eminently characteristic of life zones and regions, agreeing well with those drawn from study of the vertebrates.* It is in many cases dependent

*This is noticeable even a cursory glance at the cosmopolitan distribution of the family.

on and confirmatory of geological changes. For these reasons and those noted at the beginning, viz. — wide distribution, terrestrial and conspicuous habits, numerical abundance, size, etc. — the family and its distribution is of high importance in a study of life zones in their relation to agriculture and of faunal regions in their relation to general science.

In conclusion, while the evidence here presented is drawn largely from personal experience, I wish to acknowledge my indebtedness also to Messrs. Scudder, Henshaw, Beutenmüller, McNeill, Harvey, and others through data furnished by their publications, collections, or notes of various kinds. Owing to the total lack of data from

broad portions of the district it is manifestly impossible to draw definite boundaries at present for the faunal areas of locust-distribution, and I am under great obligations to Mr. Scudder for permission to reproduce from his faunal and climatal map those portions and features most desirable for examination in this connection. The terminology used, in a few cases now needing revision, is, for convenience, the same as that in my "Notes on New England Acridiidae" (Psyche, Oct. 1894 to Dec. 1898), which contain fuller details — seasonal, physiographical, and geographical — of the distribution of each species in New England than can be given in the limits of this sketch.

POSTSCRIPT ON PERDITA.

I have now before me mounted heads of *P. semicrocea*, which is the nearest to Smith's typical species I have seen, and of *P. verbesinae* which is a typical *Cockerellia*. The actual palpal differences are as follows:—

P. semicrocea. Labial palpi with the first joint about or hardly as long as the other three together; second longer than third or fourth, which are about equal to one another. Maxillary palpi with the last three joints about equal to one another, and longer than first three.

P. verbesinae. Labial palpi with the first joint about or over twice as long as the other three together; the other three subequal, but the third the shortest. Maxillary palpi with the first joint longest, the others about equal to one another, except that the second is shortest.

I must admit that there is more difference than I had supposed.

T. D. A. Cockerell.

Mesilla Park, Nov. 7.

RECENT LITERATURE.

THREE entomological works of a more or less popular character have been issued recently and demand brief notice.

The readers of PSYCHE are well acquainted with the careful observations of the habits of insects made by Mr. and Mrs. Peckham of Milwaukee. The State of Wisconsin has now published a volume by them on the instincts and habits of the solitary wasps. It is replete with interest and merits unqualified praise. The care, patience and assiduity of the authors in following the study of their little friends to the minutest details of their little life and by night as well as by day, has

enabled them to issue a work of the liveliest interest and importance. It should stir many another to like industry. The habits of some twenty-two genera, often of several species under each, are studied, and even their individual idiosyncracies in many cases discovered and related. The illustrations add much to the value of the book, but the inspiring example of faithful work is its chief merit.

Mr. W. F. Kirby of the British Museum has just issued a little book, entitled *Marvels of Ant Life* (London, S. W. Partridge & Co). Although a compilation and so lacking the spirit of the work of an original observer, it is very well compiled, and in the short space of 174 pages covers sixteen chapters in the separate consideration of ants as architects, agriculturists, mushroom-growers, hunters, honey-pots, cattle-keepers, slaveholders, soldiers, etc., and culls from the abundant but widely scattered literature the best instances that can be given, and which are put together with skill. A general bibliography is appended, in which we miss Forel's extended paper on ants' nests, published in Zurich in 1893, and translated for the Smithsonian Report of 1894.

Chancellor W. J. Holland's *Butterfly Book* (New York, Doubleday and McClure Co.), is a "popular guide" to North American butterflies, and has its special value from illustrating in color some five hundred species with 750 figures. They are "three-color prints," and are astonishingly accurate reproductions from nature to the minutest detail, surpassing the best chromolithographs and only occasionally falling short, where the registry is imperfect or the original specimens are not altogether satisfactory; Nature, not a draughtsman, does the work for color as well as pattern. The work will add greatly to the interest of the butterfly collector, for it is published at the extraordinarily low price of three dollars, and figures most of our species north of Mexico. We are disappointed to find the life histories ignored.

STATE ENTOMOLOGIST OF NEW YORK.—The Country Gentleman states that the regents of the University of New York have appointed Ephraim Porter Felt, state entomologist, a previous appointment by the governor having proved to be without authority in law.

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PSYCHE.

THE MOUTHPARTS OF THE NEMATOCEROUS DIPTERA, II.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIFORNIA.

In the following account of the mouthparts of the Nematocera, that nomenclature of parts is used which represents the interpretation of the mouthpart homologies most widely accepted at the present time. As some nomenclature is necessary and the author's interpretation of the homologies may not, consistently with the point of view adopted in this study, be set out until the testimony of the study has been presented, the nomenclature of common acceptance is naturally used. As the mouthparts of one representative, at least, of each family, are figured from drawings made by camera lucida, the descriptions of the various parts are made very brief. Owing to the limitations of space, in most instances the mouthparts are figured *in situ* alone; in some instances, however, figures of two or three of the isolated parts are given. As all the Nematoceros mouthparts are alike in essential character and arrangement, the figures of the cross sections of the mouthparts of *Blepharocera capitata* illustrate nearly as well the conditions

presented by any other of the mandible-possessing Nematoceros females.

BLEPHAROCERIDAE.

Liponeura? sp. This species is a large undescribed Blepharocerotid, taken by me in California, and should probably be made the type of a new genus. The mouthparts of the female consist of the following well developed, independent and easily distinguishable parts shown in figure 1 *in situ* to reveal the relative size and natural position with regard to each other: a labrum-epipharynx (*l. ep*), a pair of mandibles (*md*), a pair of maxillae (*mx*), a labium (*li*) and a hypopharynx (*hyp*).

The *labrum-epipharynx* (fig. 1 A, l. *ep*) is elongate, slender, and pointed, and bears numerous taste pits (?) on its lower (inner) surface which is concave.

The *mandibles* (fig. 1 A, *md*) are long, slender, well chitinized, and each is sharply, finely and conspicuously serrate along the distal half of the inner margin. The mandibles are articulated with the head capsule wholly distinctly from the other mouthparts.

The *maxillae* (fig. 1 A, *mx*) consist of a single short, tapering, blade-like, thin but well chitinized maxillar lobe (*mx. l*) and a long, slender, 5-segmented palpus (*mx. p*). Lobe and palpus arise from a basal sclerite, which shows no differentiation into cardo and stipes, and may be taken to represent these two sclerites completely fused.

The *labium* (fig. 1 A, *li*) consists of a strong elongate basal sclerite which presents indications of a line of fusion of sub-mentum and mentum, and a pair

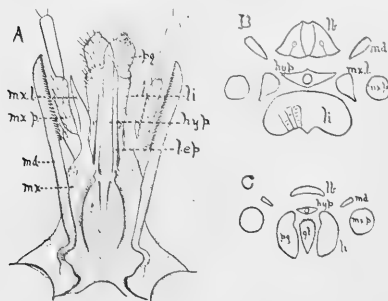


Fig. 1, A, Mouthparts of *Liponeura* ? sp., ♀; *l. ep* labrum-epipharynx, *md* mandible, *mx. maxillae*, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *hyp* hypopharynx; B, Cross section near the base of the mouthparts of *Blepharocera capitata* ♀; C, Cross section near the tip of mouthparts of *Blepharocera capitata* ♀; lettering in B and C same as in A, with addition in C of *gl* glossa, and substitution of *lb* for *l. ep* (= labrum-epipharynx).

of free fleshy terminal lobes, the paraglossae (*pg*) (see account of *Blepharocera capitata*). These terminal lobes

have no pseudo-tracheae. There are no palpi.

The *hypopharynx* (fig. 1 A, *hyp*) is as long as or slightly longer than the labrum-epipharynx, is narrower, and although thin, well-chitinized. It lies along the dorsal surface of the labium underneath the labrum-epipharynx.

As shown in figure 1 A, the mouthparts, excepting the mandibles, are carried somewhat forward by the extension of their bases or of the frontal part of the head-capsule. The various parts of the mouth dissect apart readily.

Blepharocera capitata. The mouthparts of the female resemble the mouthparts of the previously described member of the family with, however, certain interesting differences in the labium. The basal sclerite of the labium terminates proximally in a strongly chitinized sub-crescentic portion, much like the sub-mentum of certain orthopterous forms. There are three independent (at least, distally) terminal lobes instead of two, the outer two of which may be taken to be the paraglossae, and the inner median one the fused glossae or inner lobes. Series of cross sections of the mouthparts *in situ* show well the general relation of the parts (fig. 1 B and C), and show that the terminal lobes of the labium are distinct distally, and that the hypopharynx is traversed from base to tip by a cylindrical channel. This is of course the efferent duct of the salivary glands. The sections show plainly the origin

of the hypopharynx from the dorsal surface of the labium (floor of the mouth).

In the male* the mandibles are wanting, the other mouthparts being as in the female.

I have examined the mouthparts of pupae, male and female, of various ages, and find some interesting conditions, but this is ontogenetic study, and we shall for consistency's sake present now only the results of the study of the comparative anatomy of the adults.

SIMULIIDAE.

Simulium sp. In the females of *Simulium sp.* the mouthparts (fig. 2) are of the type presented by *Blepharocera* but present some interesting modifications. The mouthparts are short and broad in general character, instead of elongate. The *labrum-epipharynx* (fig. 2 *l. ep*) is broadly and bluntly triangular and can be readily separated into two lamellae, a dorsal and a ventral one, obviously labrum (fig. 2 *lb*) and epipharynx (fig. 2 *ep*) respectively. The epipharynx presents, at its distal extremity, four minute strongly chitinized processes, evidently mere special chitinizations of the epipharyngeal cuticula. The *mandibles* (fig. 2 *md*) are short, broad (as compared with the mandibles of the *Blepharocera*), thin and weakly chitinized. They have a well-defined articulating condyle at

base. The *maxillae* (fig. 2 *mx*) consist of a basal sclerite, a long 5-segmented

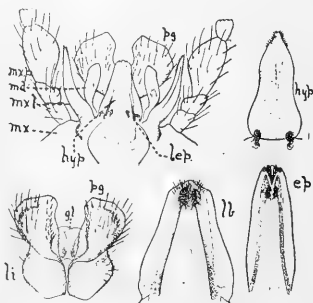


Fig. 2. Mouthparts of *Simulium sp.*, ♀; *l. ep* labrum-epipharynx, *md* mandible, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *g* glossa, *hyp* hypopharynx, *lb* labrum, *ep* epipharynx.

palpus and a single maxillar lobe reaching nearly to the end of the third palpar segment. This is serrate on its inner margin at the tip, and is better developed than in most of the Nematocera. The *labium* (fig. 2, *li*) is short, broad, with a short basal sclerite and three terminal lobes, two large free paraglossae, and a median short membranous lobe, the fused glossae. The terminal lobes present no sign of pseudo-tracheae. There are no palpi. The *hypopharynx* (fig. 2, *hyp*) is about as long as the labrum-epipharynx but narrower and its narrowly pointed apex is finely serrate on both margins.

Simulium sp. A second species of

* In the Zoologischer Anzeiger no. 557, p. 280, 1898, I have said mistakenly that the mandibles are present in the male.

Simulium examined presented no differences in mouthparts structure.

are free and independent to their bases. The *hypopharynx* (fig. 3, *hyp*) is a little

CHIRONOMIDAE.

Ceratopogon sp. The mouthparts of females present, as shown in figure 3, parts similar to those described for the Blepharoceridae and the Simuliidae. The well-chitinized *labrum-epipharynx* (fig. 3, *lb*) is elongate, broad at base and tapering to a blunt tip which bears two minute processes of the character of those of the Simuliid epipharynx. The *mandibles* (fig. 3, *md*) articulating on either side of the labrum-epipharynx are, with it, borne by a portion of the head capsule produced anteriorly so that the bases of labrum and mandibles lie considerably in front of the bases of maxillae and labium. Each mandible articulates with a slight projecting process of the head capsule. The mandibles are strongly chitinized, elongate, narrow with convex outer margin, and with a few strong, sharp teeth (dentations) on the apical inner margin. The *maxillae* (fig. 3 *mx*) consist of slender 5-segmented palpus (*mx. p*) and single blade-like maxillar lobe (*mx. l*) reaching to end of second palpar segment. The *labium* (fig. 3 *li*) bears but two terminal lobes, the paraglossae, and these appear to be 2-segmented. They

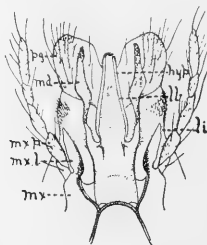


Fig. 3, Mouthparts of *Ceratopogon* sp., ♀; *lb* labrum-epipharynx, *md* mandible, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *hyp* hypopharynx.

broader than the labrum-epipharynx, is weakly chitinized, and is weakly but conspicuously serrate at its apex.

The males of *Ceratopogon* have no mandibles, and the maxillae have no terminal lobe, and only 4-segmented palpi.

Chironomus sp. In females of *Chironomus* we meet a mouth structure differing essentially from that of females of *Ceratopogon* in that there is lacking in *Chironomus* the mandibles and the maxillar lobes. The mouthparts of *Chironomus* are also short and broad and not elongate as in *Ceratopogon*. *Chironomus* does not possess, as *Ceratopogon* does, piercing mouthparts.

EXCHANGE DESIRED.—Dr. A. Griffini of the University of Turin, Italy, desires to obtain American specimens of *Cybister* and

Dytiscus, pinned or in alcohol, in exchange for Italian insects of any order. Address as above.

ON THE GENUS THLIPSOGASTER ROND.

BY S. W. WILLISTON, LAWRENCE, MASS.

In the Transactions of the American Entomological Society for March, 1895, p. 108, Mr. Coquillett referred to this genus of Rondani two American species, *T. ater* Coq. which I have before me from Mexico, and *T. syndesmus* Coq., which I have seen from Kansas. A careful examination of the literature assures me, however, that there is no real relationship between our species and the types of Thlipsogaster. Whether or not the species described by Mr. Coquillett and several other allied ones known to me should receive a new generic name is a question that I will leave in abeyance. The only real difference from *Bombylius* which they present is in the first posterior cell of the wings being closed in the margin instead of at some distance from it. Apparently additional characters are found in the peculiar markings of all the known species; all of them, for instance, possessing a silvery spot near each eye at the base of the antennae. Were these characters confined to such species as present the neurational character, I should not hesitate to give the genus another name. Unfortunately, however, such species as *Bombylius lugubris* Loew, and *B. ater* Lin., especially the latter, seem to have very similar markings, though the first posterior cell is closed remotely from the margin. As *T. ater*

Coq. must be retained in the genus *Bombylius* for the present, at any rate, the specific name *Coquilletti* may be substituted in order not to conflict with *B. ater* Linn.

My reasons for rejecting *Thlipsogaster* Rond. for these species are as follows:

Thlipsogaster Rond. was separated from *Thlipsomyza* Wiedemann in a very imperfect way as follows: "Al genero fondata dal Wiedman per una specie Africana furono aggiunte altre due parimenti dall' Affrica dal Macquart, ma diversi caratteri di queste non combinano con quelli della prima, per maniera che si rende necessaria la loro separazione almeno in due generi."

"AA. Alarum areolae submarginales duae tantum. * *"

BB. Venae longitudinales alae quinta et sexta [tertia et quarta] sejunctim marginem alae attingentes vel vix in ipso contiguae.

G. *Thlipsogaster* Mihi.

Cont. Sp. Castanea et Heteroptera Macq."*

In all probability Rondani had not seen these species when he erected the genus, but took the characters from Macquart. Turning to Macquart †

* Arch. per la Zool. 1863, p. 72.

† Dipt. Exot. ii, 4, 32 and 113.

we find the following characters assigned to them: "Tête aussi large que le thorax" (p. 32). "Ce genre [Thlipsomyza], dont le caractère le plus apparent est l'abdomen comprimé et muni de soies sur les bords des segments, a pour le type le *T. compressa*, Wied., *Bombylius id.*, Fab., d'Alger. Nous y joignons deux espèces nouvelles, également du nord de l'Afrique, dont l'une, le *T. heteroptera*, diffère des autres par la première cellule postérieure ouverte. Ces Bombyliens se distinguent encore des autres par les soies qui bordent les segments de l'abdomen."

Of *T. castanea*, he says: "C'est peut-être une variété du *T. compressa*."

In his specific descriptions, Macquart gives a quite different type of coloration for his species, and in his figure of *T. heteroptera* the bristles of the abdo-

men are conspicuously indicated. Furthermore, the abdomen, like the whole body, is bare and elongated. All of these characters are so "himmelweit" from the *Bombylius* type, to use Wiedemann's own expression, that one is surprised that the identity of our forms should have occurred to Mr. Coquillett. It is interesting to observe that both Schiner and Loew refused to accept *Amictus* Wied. as being distinct from *Thlipsomyza*, based as it was chiefly on the open or narrowly closed first posterior cell, the sole character assigned to *Thlipsogaster* by Rondani. *Eurycaenus* Loew seems to be a nearly allied genus.

The moral of it is that Rondani's genera, like Walker's species, are to be accepted with fear and trembling.

ARKANSAS MELANOPLI—I.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

The recent publication of Scudder's excellent Revision of the Melanopli by making it possible to recognize with certainty those species which have already been described suggested the propriety of placing on record the species of this group which are known to occur in Arkansas. This seemed to be the more desirable because almost nothing is known of the Orthopteran fauna of this State. The list here given is undoubtedly very far from complete

as the collections upon which it is based have been made almost entirely in the seven or eight counties of Northwestern Arkansas. Altogether nineteen species representing six genera are known. *Melanoplus* includes fourteen of these species and two of these *Mel. baconi* and *Mel. sylvaticus* are apparently undescribed. Two others *Mel. impudicus* Scudd. and *Mel. impiger* Scudd. were described very recently in Scudder's monograph cited above.

Of the remaining five genera, it may be said that the occurrence of *Phoctaliotes*, *Hesperotettix* and *Dendrotettix* was quite to be expected. *Campylocantha*, however, has not been reported so far east before and *Paratyotropidia* has hitherto been known by a single pair of specimens from localities so widely separated as Texas and Dakota.

Paroxya may certainly be expected to

occur in the southern and eastern parts of the State. It is altogether probable too that a considerable number of Texas forms will be found in the valley of the Red River in Southwestern Arkansas.

The keys which follow have been based directly upon females, though they should apply nearly equally well to males.

KEY TO GENERA OF MELANOPLI FOUND IN ARKANSAS.

- A¹ Frontal costa not twice as wide below the ocellus as between the antennae.
 - B¹ Shoulders of the pronotum well rounded, disk subtectiform; frontal costa percurrent, and sulcate to the clypeus.
 - C¹ Eyes separated by a space several times as wide as the basal joint of the antennae; tegmina less than half the length of the abdomen; median carina of the pronotum cut by the first and second sulcus. *Campylacantha*.
 - C² Eyes separated by a space but little wider than the basal joint of the antennae; tegmina much more than half the length of the abdomen; median carina of the pronotum not cut by either the first or the second sulcus. *Hesperotettix*.
 - B² Shoulders of the pronotum decidedly angulate, at least on the metazone, frontal costa rarely percurrent and never sulcate to the clypeus.
 - C¹ Space between the eyes nearly as broad as the transverse diameter of the eye, posterior margin of the pronotum scarcely more distinctly angulate than the anterior.
 - D¹ Transverse sulci of the pronotum very deep, the first two as distinct as the last, all cutting the median carina; shoulders of the prozone well rounded. *Dendrotettix*.
 - D² Transverse sulci of the pronotum not especially deep, the first two much less distinct than the third, shoulders of the prozone not less plainly angulate than those of the metazone. *Paratyotropidia*.
 - C² Space between the eyes narrower than the transverse diameter of the eyes; posterior margin of the pronotum usually much more angulate than the anterior. *Melanoplus*.
- A² Frontal costa twice as wide below the ocellus as between the antennae, head very large in proportion to the body. *Phoctaliotes*.

Campylacantha olivacea Scudd.—I have specimens from Fort Smith and Fayetteville as well as from Mackey, I. T. The earliest recorded date for its capture is August second, the latest October eighth, though doubtless some specimens survive until settled cold weather which generally does not come until after Christmas. It is a rather rare species so far as my observation goes, though it is sometimes abundant locally. It occurs in dry pastures.

Hesperotettix pratensis Scudd.—A single female was found in the summer of 1897 near Buffalo City, Marion County which I refer to this species with some hesitation. It was found in the mouth of a gully at the foot of the divide between Big Buffalo and White Rivers. Timber occurred sparsely here but vegetation was abundant. A long search in this vicinity failed to reveal any more specimens.

Dendrotettix quercus Riley.—This species is represented in my collections by one male and six females, all except one female captured near Clifty, Carroll Co., June twenty-ninth. The female referred to was taken near Elkins, Madison Co., July thirty-first.

Paratylotropidia brunneri Scudd.—This very interesting and apparently very rare species is found in Arkansas. It is represented in my collection by a single pair, male and female, captured near Clifty, Carroll Co., June twenty-ninth. I refer these specimens unwillingly to the same species as they are remarkably different in the distinctness of the lateral carinae which are obsolete in the female and very distinct in the male, and in the fastigium of the vertex, which is not perceptibly declivent in male and exceedingly prominent, while in the female it is moderately declivent and distinctly less prominent. In other respects they agree as well as male and female of the same species usually do. The single pair, male and female, known to Scudder were from Dakota and Texas respectively. As the male was an imperfect specimen, the structure of the furcula could not be given.

The Arkansas male shows not the faintest trace of furcula and the last dorsal segment is not interrupted in the median line. The female at first glance has very much the appearance of a short winged *Melanoplus bivittatus* Say.

A NEW VARIETY OF CHIONASPIS FURFURUS FITCH, AND NOTES ON OTHER SPECIES.

BY GEO. B. KING, LAWRENCE, MASS.

Chionaspis furfurus Fitch. var. *fulvus*. n. var.—Scale of female.—Shape variable, some pyriform and flat, others quite elon-

gated ovoidal and convex. Length also variable; length including exuviae 3, 2½ and 2 mm. The width of these are quite constant,

$1\frac{1}{2}$ mm., while those of the convex forms are 3 mm. long and 1 wide, and these are covered more or less with the epidermis of the bark of the food plant, which gives the scale the appearance of being yellowish brown instead of white as in the typical *C. furfurus*. The female agrees very well with *C. furfurus*, found on several other food plants in this locality. The eggs are dark purplish red. And the male scales are small and of the same normal form of the genus. The most conspicuous difference is in the lively color of the epidermis white scale of the female, giving them a very peculiar and distinct appearance from the scales of the typical *C. furfurus*.

Hab. — Lawrence, Mass., Oct. 15, 1898, on buckthorn (*Rhamnus catharticus* L.) The hedge infested is over 100 feet long, and to all appearances there is not a twig without some of the scales, and many of them covered with them, so much so that they are noticeable a long distance off.

Prof. Cockerell suggests that I give a few notes on other species covered with epidermis of their food plant, and has very kindly given me these references. *Howardia biclavata* Comst. is a species normally covered by epidermis, but Mr. Maskell has given the name var. *detecta*, to a form not so covered. *Aspidiotus cydoniae*, var. *tecta* Mask. is a variety covered with the epidermis of its food plant as in *C. fulvus*. *Chionaspis minor* var. *timida* Ckll. (MS.) is also a form covered by the epidermis of Hibiscus, found by Mr. Barber on the island of Antigua. Of course it is a matter of taste whether such forms as the above should be named. I believe, however, that they should be. *Chionaspis furfurus* var. *ulmi* Ckll. is a variety found on elm at Brownsville, Texas, by Prof. C. H. T. Townsend, and is not covered with epidermis.

The food plants of *Chionaspis furfurus* Fitch are: choke-cherry (*Prunus virginiana*), black cherry (*P. serotina*), wild red cherry (*P. pennsylvanica*), wild and culti-

vated apple (*Pyrus* sp.), crab apple, etc., pear (*Pyrus communis*), peach (*Persica vulgaris*), Japan quince (*Cydonia japonica*), cherry currant var. (*Ribes* sp.), red flowering currant (*Ribes sanguineum*), European mountain ash (*Larbus ancuparia*). The following in Massachusetts: wild red cherry, pear, wild and cultivated apple, flowering quince (*Pyrus japonica*), choke-berry (*Pyrus arbutifolia*), shad bush (*Amelanchier canadensis*), black alder (*Clethra alnifolia*). The last four food plants are here recorded for the first time, and found by me; all of the others are from Dr. L. O. Howard.

Predaceous enemies. — *Chilocorus bivulnerus* Muls. (Walsh and Riley, W. Saunders). *Hyperaspisidius* sp. (C. P. Gillette). *Tyroglyphus malus* Shimer (W. Saunders). Parasited by *Alberus clisiocampae* Ashm. (Howard).

Distribution. — Dr. Howard has been so kind as to give me a complete list taken from his card catalogue.

Virginia: — Blacksburg, Buckland, Crozet, Covesville, Huntingdon valley, Monassas, Miller School, Morrisville, Maynesboro, Staunton, Tomsbrook, Vienna, Wellington, Woodstock, Warrenton, Waldrop, Winchester. *Maryland*: — Baltimore, Foxville, Harris Lot, Harney, Hagerstown, Still Pond, Wingate, Williamsport. *Pennsylvania*: — Bird in Hand, Chestnut Hills, Craley, Concordia, Floradale, Fricks, Gum Tree, Marion, North Hope, Philadelphia, Pine Grove, Rutledge, Stony Brook, Waynesboro, Yorkana. *Illinois*: — Cambridge, Centralia, Good Hope, Grape Creek, Hopedale, Leanderville, Loda, McLeansboro. *Indiana*: — Boonville, Brookville, Carthage, Jasonville, Mitchell, Terre Haute. *West Virginia*: — Burlington, Gerrardstown, Little Georgetown, Pow Pow, Roanoke. *Northern California*: — Blowing Rock, Fruitland, Greensboro, Waynesville. *Ohio*: — Cleveland, Horne City, Wooster. *New York*: — Hudson, Rye. *Delaware*: — Dover, Newark. *Kentucky*: — Buckner, Valley Station. *Rhode Island*: — Kingston,

Providence. *Connecticut*:—Nichols, Wilton. *Georgia*:—Augusta. *Utah*:—Sugar, *Tennessee*:—Cagle. *Kansas*:—Lawrence. *New Jersey*:—New Brunswick. *Washington, D. C.* *Massachusetts*:—Amherst, Worcester, Lawrence, Andover, Methuen. The three last are new localities.

In England, at Hereford, in 1890, on *Ribes sanguineum*. (*Morgan*). It is also found in Canada, being included in the check-lists of insects of the Dominion of Canada, compiled by the Natural History Society of Toronto and published in 1883. [*Henshaw*].

Chionaspis furfurus has been cited as being found at New Mexico (Bull. No. 3, N. M., Agr. Exp. Sta., Jan. 1891); but Prof. Cockerell assures me that it has never been found there. Walsh in *Practical Entomologist*, vol. 1, p. 64, 1866, lists it as being very common on willow in Illinois. And Riley in *American Naturalist*, 1881, vol. 15, p. 487, received them on raspberry from Oxford, Miss. There is, perhaps, some doubt as to

the identification of the scales on these food plants.

Chionaspis furfurus Fitch is a native species, and was first observed by Harris in 1841, and was named by Fitch in 1856. It has been commonly known as the scurfy bark louse and Harris bark louse, and cited by many authors as *Aspidiotus furfurus*, *A. cerasi*, *Coccus harrisii*, *Aspidiotus harrisii* and *Diaspis harrisii*.

POSTSCRIPT.—Since the above was written, I have received the following, kindly furnished me by Prof. James Fletcher of Ottawa, Canada. *Chionaspis furfurus* has been received from Nova Scotia, New Brunswick, and Prince Edwards Island, and many have been imported on nursery stock. It is not an uncommon species, but at the same time by no means of frequent occurrence throughout Ontario west of this point to the Niagara Peninsula and up to Lake Huron and Georgia Bay. It has not been received from British Columbia.

DESCRIPTION OF THE LARVA OF CALOCAMPA CURVIMACULA.

BY HARRISON G. DYAR, WASHINGTON D. C.

I received these eggs through Dr. Ottolengui under another name, but the determination was corrected by breeding. The mature larva has been briefly described by Dr. Thaxter. The generic term *Calocampa* is utterly inapplicable to this species, as the larvae are plain, ordinary noctuids, far from "beautiful."

Egg. Hemispherical, rounded below, the flat base small; strongly vertically ribbed, beaded, with ring-like micropyle. There are about 40 ribs around the base, but they diminish in number upward, not confluent and are finely beaded. Diameter .8, height .5 mm.

Stage I. Head rounded, pale brown, not shining; width .4 mm. Body slender, gait

slightly looping, the abdominal feet of joints 7 and 8 much smaller than the others, especially on joint 7. Joint 12 a little enlarged. Body smooth, light gray, food visible; tubercles large, nearly black, circular, iv equidistant between iii and v, vi not present; setae dark, distinct, but short. Cervical shield brown; no anal plate. After feeding the larvae became pale green.

Stage II. Head pale greenish; width .6 mm. Body long, slender, feet of joints 7 and 8 very small; not shining sordid green with narrow white dorsal, subdorsal and broader stigmatal lines, none very distinct. Tubercles minute; setae distinct, dark, normal. Segments very indistinctly annulate.

Stage III. Head whitish green, not shin-

ing; ocelli black, mouth faintly brown; width 1 mm. Body green; dorsal line straight, white, crinkly edged; tubercles i and ii white; subdorsal line straight, narrow, white; tubercles iii and iv less distinctly white; substigmatal line distinct white, moderately broad, somewhat shaded below, just covering spiracles. Feet green, those of 7 and 8 smaller than the others. Tubercle iv opposite lower edge of spiracle.

Stage IV. Head 1.8 mm. All pale green, joint 12 a little enlarged; feet nearly equal. Lines and tubercles white, dorsal and subdorsal lines narrow, rather pulverulent; stigmatal moderate, enclosing the spiracles except on joints 2 and 12, a dark green shade above it reaching to tubercle iii. Feet green, shields and plate uncornified, obscure. Tubercles minutely black in white rings; iv at the lower edge of spiracle; setae rather long, fine, dusky. Spiracle white, finely black rimmed.

Stage V. Head green, ocelli narrowly black centrally, labrum white; width 2.7 mm. Green, plates invisible; skin finely white dotted, lines white; dorsal line distinct, obsolete at the ends; subdorsal narrow, faint, half as wide as the dorsal; stigmatal narrow, about the width of the spiracles which it half encloses except on joints 2 and 12, covering tubercle iv; a dark green shade above, diffuse,

fainter at the spiracles. Subventer white dotted; feet clear green, equal. Body slender, joint 12 slightly enlarged. Tubercles and spiracles white, the latter ringed.

Stage VI. Head pale brown, shining, reticulate with darker brown, shaded in clypeus and at base of antennae; labrum whitish; ocelli pale; width 4.6 mm. Body cylindrical, joint 12 a little enlarged on top; feet equal. Light yellow-brown; dorsal and subdorsal lines narrow, pulverulent and broken, brownish white, bordered with darker brown; oblique subdorsal shades brown, running between tubercles i and ii forward and outward; skin mottled, dotted with whitish; substigmatal line moderately broad, whitish on the edges, centrally of the color of the body, the lower edge finally fading out, leaving a very narrow pale line cutting the spiracles. Feet pale; setae white; cervical shield and anal plate not cornified, not lined. Spiracles white, black ringed. Later the larvae fade to a pale greenish brown, the lines becoming faint and the head appearing dark by contrast. Setae single, normal, iv opposite lower edge of spiracle.

The larvae hatched early in May and entered the earth in June. They fed on various leaves, but seemed to prefer willow, on which they thrive. The imagoes appeared in August.

FOUR NEW SPECIES BELONGING TO THE GENUS *PLENO- CULUS* FOX.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

The genus *Plenoculus* Fox was erected in *Psyche*, Vol. VI, 1893, p. 554, with one species *P. davisi*. Since that time, however, four additional species have been described, three by Fox and one by myself. I have now the pleasure of presenting descriptions of four new species and giving a table for distinguishing all of the species.

The genus is unknown outside of boreal, North America.

Table of Species.

Clypeus anteriorly not emarginate medially 2

Clypeus anteriorly emarginate, or excised medially, dentate or denticulate laterally.

Five teeth on each side of the median emargination; abdomen black, the apical margins of segments more or less testaceous; mandibles except tips and the tibiae and tarsi more or less pale ferruginous; the tibiae blackish beneath; first joint of flagellum slightly shorter than the second. ♀.

(1) *P. davisii* Fox.

Two teeth on each side of the median emargination; abdomen black or more or less dusky on basal three segments, in the latter case the second ventral segment always with an oblong black spot on each side, the ventral segments 3-5 also more or less dusky basally; mandibles pale ferruginous with black tips; anterior tibiae, except behind, and the anterior and middle tarsi ferruginous; first joint of flagellum as long as the second. ♀.

(2) *P. propinquus* Fox.

2. Clypeus anteriorly triangularly produced medially 5

Clypeus anteriorly slightly rounded or subsemicircularly produced 3

Clypeus anteriorly truncate medially.

Anterior margin of clypeus broadly squarely truncate with a delicate raised margin, without lateral teeth; abdomen mostly rufous, blackish towards apex; head thorax and abdomen closely and rather strongly punctate; legs black with the anterior tibiae and tarsi and the mandibles rufous. ♀.

(3) *P. punctatus* n. sp.

Anterior margin of clypeus subtruncate medially; abdomen, except extreme apex which is red, black; the apex of the segments narrowly testaceous; mesonotum and scutellum finely closely punctate; legs, except coxae, rufous. ♀.

(4) *P. parvus* Fox.

3. No lateral tooth on anterior margin of clypeus 4

A lateral tooth on anterior margin of clypeus.

Clypeus, mandibles, except tips, the anterior femora beneath, and all tibiae and

tarsi, yellowish; the middle and hind tibiae have a dusky blotch within toward apex; abdomen entirely black. ♂.

(2) *P. propinquus* Fox.

Clypeus, mandibles and palpi, pale yellowish; the anterior femora with a large white spot beneath at apical three fourths; all tibiae and tarsi pale yellowish, the tibiae more or less brown or black within or beneath; abdomen rufous. ♂.

(5) *P. abdominalis* n. sp.

4. Head and thorax black; abdomen rufous; anterior and middle femora beneath with a large white spot at apex, the hind tibiae and tarsi yellowish. ♀.

(6) *P. cockerellii* Fox.

Wholly black, the hind tibial spurs white; abdomen finely, minutely punctate, with some silvery pubescence, especially at apex of segments and laterally; first joint of flagellum distinctly shorter than the second; face with silvery pubescence. ♀.

(7) *P. niger* n. sp.

5. Black, the head and thorax closely, distinctly punctate, mandibles piceous towards tips; hind tibial spurs whitish; tarsi brownish; abdomen shining but still finely punctate. ♂.

(8) *P. peckhami* Ashm.

Black, the mandibles except tips, the superior margin of pronotum, interrupted at the middle hind margin of tubercles, tegulae, postscutellum, the apical three fourths of the front femora, the apex of middle femora and all tibiae and tarsi white, but the tibiae beneath are black. ♂.

(9) *P. albipes* n. sp.

(3) *Plenoculus punctatus* n. sp. ♀. Length 5.5 to 6 mm. Head and thorax black confluent punctate. Clypeus squarely truncate anteriorly with a delicate but distinct raised rim, minutely punctate, smoother anteriorly and with several large scattered punctures. Palpi and mandibles rufous or ferruginous, the tips of the latter black. Antennae black, the flagellum rather stout, gradually incrassated towards apex, the scape with a rufopiceous spot beneath towards apex. Legs black with the anterior tibiae and tarsi rufous

or ferruginous. Wings hyaline or subhyaline, the stigma and veins black or piceous black, the second recurrent nervure interstitial with the second transverse cubitus; tegulae black punctate. Abdomen distinctly punctate, rufous, the apical segments 4-6 more or less blackish; pygidium distinctly punctate, the lateral carinae, forming the pygidial area, somewhat produced at apex so as to make the tip of the abdomen appear tridentate.

Hab.—Colorado. Carl F. Baker Collection, No. 1546.

Type, No. 5066, U. S. N. M.

(5) *Plenoculus abdominalis* n. sp. ♂.—Length 2.65 mm. Head and thorax black, very finely, closely, microscopically punctate and more or less clothed with a silvery pubescence, especially on the face and the mesopleura. Clypeus, mandibles and palpi pale yellowish, the former impunctate, with a slight tooth on each side. Antennae dark rufous, the flagellum blackish above towards the base. Legs black, the anterior femora with a white spot at apical third beneath, all tibiae and tarsi pale yellowish, the tibiae more or less brown or even black beneath or within. Wings hyaline, tegulae white; stigma and veins pale brown, the second recurrent nervure joining the petiolated second submarginal cell near its apex before the second transverse cubitus. Abdomen wholly rufous, subopaque, but not punctate.

Hab.—Arizona. Carl F. Baker Collection, No. 2123.

Type, No. 5067, U. S. N. M.

(7) *Plenoculus niger* n. sp. ♀.—Length 4.6 mm. Wholly black, closely punctate, the head distinctly punctate, the face clothed with a silvery pubescence; there is also a distinct silvery pubescence on the pleura and also more or less on the abdomen but

not so dense or decided as on the face. Clypeus subsemicircularly produced medially, without a lateral tooth. Mandibles black rufous toward tips. Palpi brownish. Metathorax coarsely sculptured with oblique and transverse striations. Wings subhyaline, the tegulae, stigma and veins brown-black; the first recurrent nervure is interstitial or almost with the first transverse cubitus, while the second recurrent joins the second submarginal cell between its middle and apex. Abdomen very finely but distinctly punctate, the pygidium smooth, the lateral carinae very delicate.

Hab.—Colorado. Carl F. Baker Collection No. 2170.

Type, No. 5068, U. S. N. M.

(9) *Plenoculus albipes* n. sp. ♂.—Length 3 mm. Black, the head closely, finely punctate, opaque, the face with a dense silvery pile; mandibles except tips, superior margin of pronotum interrupted medially, hind margins of tubercles, tegulae, postscutellum, apical three-fourths of front femora beneath, apex of middle femora and all tibiae, except beneath, and the tarsi white. Mesonotum shining but finely punctate; metathorax finely rugulose, the meso- and meta-thorax clothed with a silvery pubescence. Wings hyaline, the stigma and veins brown, the first recurrent nervure uniting with the cubitus before the first transverse cubitus, the second recurrent joining the second submarginal cell beyond its middle. Abdomen subcoriaceous, with a silvery pubescence at apex of segments and more or less laterally. Terminal joint of antennae very large, ovate in outline but subcompressed.

Hab.—Colorado. Carl F. Baker Collection, No. 2358.

Type, No. 5069, U. S. N. M.

A NEW VOLUME OF PSYCHE

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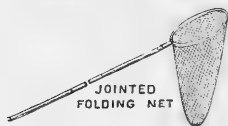
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[Established in 1874.]

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APRIL, 1899.

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PSYCHE.

ARKANSAS MELANOPLI. — II.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

KEY TO MELANOPLUS.

A¹ Tegmina rarely shorter than the abdomen when much shorter the species are large, (more than one inch in length) and robust.

B¹ Size large, never less than one inch in length usually much more, space between the eyes more than twice the width of the basal joint of the antennae, hind tibiae with a broad pale annulus (sometimes only apparent on the exterior face) preceded by a black sub-basal ring, median carina never obsolete upon the prozone, though often indistinct.

C¹ Tegmina scarcely ever spotted and never striped on the anal field, hind tibiae and under surface of hind femora yellow, sides of prozone not expanding posteriorly *Differentialis Uhler.*

C² Tegmina always maculate upon the discoidal field and frequently striped on the anal field, hind tibiae never yellow, either red or purplish, sides of the prozone plainly expanding posteriorly.

D¹ Hind femora rarely banded on the disk of the outer face, tegmina usually exceeding slightly or considerably the hind femora, never much shorter than the abdomen, hind tibiae red or purplish . . . *Bivittatus Say.*

D² Hind femora generally very distinctly banded upon the disk of the outer face, tegmina much shorter than the abdomen, hind tibiae never purplish. *Viola Thos.*

B² Size medium or small, space between the eyes not more than twice the width of the basal joint of the antennae, hind tibiae usually red without a pale annulus preceded by a black sub-basal spot or ring, rarely blue with the black followed by a pale ring, tegmina about equalling or more or less exceeding the abdomen.

C¹ Second transverse sulcus of the pronotum not twice as distant from the third as from the first, tegmina very rarely falling short of the extremity of the hind femora.

D¹ Median carina of the prozone frequently indistinct but some trace of it is always present at least upon the anterior part of the prozone which is not distinctly longer than the metazone.

E¹ Hind tibiae never red usually distinctly blue with the sub-basal black ring present and followed by a pale annulus or at least a pale spot exteriorly, transverse bands of the hind femora distinct upon the disk as well as upon the upper face; tegmina distinctly spotted on the discoidal field, with a linear series of alternate light and dark spots and generally less distinctly maculate with smaller spots upon the anal field.

Impiger Scudd.

E² Hind tibiae never blue, usually red or green, occasionally with a black sub-basal ring but this is never followed by a light annulus.

F¹ Sub-basal ring of the hind tibiae usually distinct, the tibiae themselves never green, tegmina obscurely spotted, sometimes slightly exceeding the hind femora but scarcely ever equalling the abdomen; black bands of the hind femora usually distinct, but sometimes confluent on the disk of the outer face; sides of the prozone expanding regularly and considerably; inferior branches of the ovipositor merely angulate upon the outer side not distinctly toothed. *Keeleri Thos.*

F² Sub-basal ring of the hind tibiae represented at most by a black or fuscous spot upon the upper face; tegmina generally exceeding the abdomen as well as the hind femora; inferior branches of the ovipositor with a distinct tooth upon the outer side.

G¹ Prosternal spine distinctly and regularly tapering upon the apical half with the apex sub-acute; median carina usually very indistinct upon the prozone, frequently almost entirely obsolete; tegmina generally distinctly spotted in the discoidal field; hind tibiae green or red. *Atlantis Riley.*

G² Prosternal spine not tapering upon the apical half, slightly transverse and broadly rounded at the tip, median carina generally distinct, through slight, upon the prozone, tegmina nearly plain or more or less distinctly spotted in the discoidal field, hind tibiae red, very rarely green. *Femur-rubrum De Geer.*

D² Median carina of the prozone entirely wanting, prozone plainly longer than the metazone; fascia of the hind femora obsolete upon the disk of the outer face; post-ocular stripe of the pronotum very indistinct or wanting; tegmina plain or inconspicuously maculate; hind tibiae red or green. *Packardii Scudd.*

C² Second transverse sulcus of the pronotum nearly twice as distant from

the third as from the first and all are indistinct; tegmina scarcely reaching the hind femora, very obscurely spotted; no post-ocular stripe upon the head or lateral lobes of the pronotum; hind tibiae coral red with not a trace of a sub-basal black ring. *Impudicus* Scudd.

A² Tegmina much shorter than the abdomen.

B¹ Hind tibiae green.

C¹ Tegmina separated by a space greater than their width. *Gracilis* Bruner.

C² Tegmina attingent or slightly overlapping. *Sylvaticus* n. sp.

B² Hind tibiae red or fuscous.

C¹ Tegmina separated by a space much greater than the width of the frontal costa. *Obovatipennis* Blatchley.

C² Tegmina attingent or overlapping.

D¹ Hind margin of the pronotum strongly angulate; tegmina decidedly longer than the pronotum and lanceolate. *Baconi* n. sp.

D² Hind margin of the pronotum slightly angulate; tegmina shorter than the pronotum, sub-elliptical in shape. *Scudderi* Thos.

Melanoplus differentialis Uhler. — This species is apparently uncommon at least in the mountainous part of the State. It is represented in my collection by specimens from Washington, Sebastian, Crawford and Marion Counties. Two specimens from the last mentioned locality collected July twentieth differ rather remarkably from other specimens from Arkansas. They are very dull brown with considerable infuscations, the tegmina being darker in the lateral than in the dorsal field, irregularly clouded over both areas and maculate on the former. The disk of the prozone is distinctly longitudinal and about half as long again as the metazone. The hind femora are shorter than in typical specimens.

Melanoplus bivittatus Say. — This very variable species is rare in Northwestern Arkansas. I have collected but four

males and two females. The males have uniformly red the females purplish hind tibiae. According to Scudder those with the red hind tibiae should be *Mel. femoratus* Burm. but I am not able to recognize the distinctness of these supposed species. Two of the males were captured June twenty-sixth near War Eagle ford on the Spring Valley and Clifty road. Another male was taken near Clifty. The other specimens were captured at several points in Marion County from July tenth to twentieth.

Melanoplus viola Thos. — This species is abundant in Northern Arkansas and probably throughout the State in suitable localities, which are wooded hillsides and tops. I have thirty-one males and twenty-nine females from Washington, Carroll, Boone, Marion, Newton, Madison and Crawford Counties in the northwestern, and Pulaski

and Jefferson Counties in the central part of the State. The earliest and latest date of its capture are June thirtieth and October twenty-sixth. According to Prof. Charles Woodworth, formerly Entomologist of the Arkansas Agricultural Experiment Station, at present of the University of California, this species sometimes lays its eggs in small holes in rocks in stone fences. It is a larger species than would appear from Scudder's measurements which are 25 mm. for male and female. Average specimens

in my collection measure as follows :

Length of body male, 25 mm. female 32 mm.

Length of hind femora male, 17½ mm. female 18 mm.

The tegmina vary from one and a half times the length of the pronotum to the length (male) of the abdomen. The cerci are quite variable and the under side is frequently red as in *Mel. clypeatus* Scudd. which is possibly only a synonym of *Mel. viola*.

THE MOUTHPARTS OF THE NEMATOCEROUS DIPTERA, III.

BY VERNON L. KELLOGG, STANFORD UNINERSITY.

DIXIDAE.

Dixa sp. The females of *Dixa* possess a mouth structure (see fig. 4) like those already described, consist-

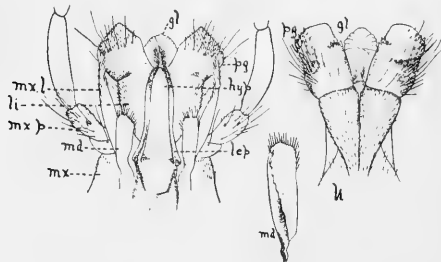


Fig. 4, Mouthparts of *Dixa* sp., ♀; *l. ep* labrum-epipharynx, *md* mandible, *mx* maxilla, *mx l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *gl* glossa, *hyp* hypopharynx.

ing of *labrum-epipharynx* (fig. 4, *l. ep*), *mandibles* (fig. 4, *md*) which are short, weakly chitinized, trowel-shaped, with truncate, distal margin with fine, deep dentations; *maxillae* (fig. 4, *mx*) with 5-segmented palpus and maxillar lobe weakly chitinized but long and conspicuous; strong *labium* (fig. 4, *li*) with free paraglossae and glossae fused to form a membranous median lobe; and *hypopharynx* (fig. 4, *hyp*) of usual type.

PSYCHODIDAE.

Psychoda sp. *Psychoda* (see fig. 5) has no mandibles and the labium presents but two terminal lobes. The *labrum-epipharynx* (fig. 5, *l. ep*) is short, broad, triangular. The *maxillae* (fig.

5, *mx*) are composed of a conspicuous maxillar lobe, which is broad and plate-like, with margins dorsal and ventral, and which is about as long as the labium, and of a long 4-segmented palpus which bears many scales. The *labium* (fig. 5, *li*) is short, broad, composed of a small, strongly chitinized, basal sclerite, and two large, fleshy, terminal lobes, the paraglossae, concave on their inner faces. The *hypopharynx* (fig. 5, *hyp*) is broad at base, tapering quickly to a sharp point anteriorly and is fringed with long strong hairs.

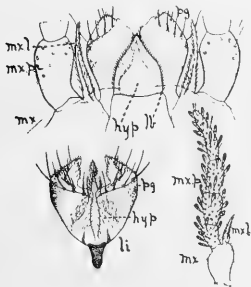


Fig. 5, Mouthparts of *Psychoda* sp; *lb* labrum-epipharynx, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *pg* paraglossa, *hyp* hypopharynx.

Pericoma sp. The mouthparts of *Pericoma* are essentially like those of *Psychoda*. The maxillar lobes are broad delicate, plate-like. The hypopharynx is fringed with long hairs. The labial lobes bear many short, strong, socketed hairs.

I have not been able to examine

Phlebotomus whose females, according to Becker, possess piercing mouthparts, with long, strong, mandibles finely dentate along the inner margin, and with maxillar lobes also long, well-chitinized and with truncate distal margin with strong dentation. All of the mouthparts of *Phlebotomus* are long and slender, while those of *Psychoda* and *Pericoma* are short and broad.

CECIDOMYIDAE.

Catocha sp. (two species studied). The mouthparts of *Catocha* (fig. 6) consist of *labrum-epipharynx* (fig. 6, *l. ep*) *maxillae* (fig. 6 *mx*) which are represented by long 5-segmented palpi only, no maxillar lobe being present, and a short broad *labium* (fig. 6 *li*)

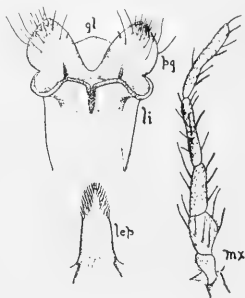


Fig. 6, Mouthparts of *Catocha* sp; *l. ep* labrum-epipharynx, *mx* maxilla, *li* labium, *pg* paraglossa, *gl* glossa.

with lateral paraglossae and fused glossae. I was unable to find a *hypopharynx*, which, however, is probably

present, the minute size of the mouthparts making their dissection very difficult.

Cecidomyia sp. The mouthparts of *Cecidomyia* sp. are essentially like those of *Catocha*.

MYCETOPHILIDAE.

Sciophila sp. *Sciophila* (fig. 7) presents an instructive mouthparts condi-

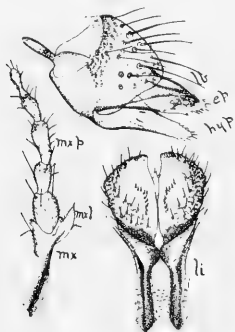


Fig. 7, Mouthparts of *Sciophila* sp; *lb* labrum, *ep* epipharynx, *mx* maxilla, *mx. l* maxillar lobe, *mx. p* maxillar palpus, *li* labium, *hyp* hypopharynx.

tion. Mandibles are wanting, and the maxillar lobe is small and rudimentary. The *labrum-epipharynx* is separable, after softening in hot K O H, into its component parts, a well chitinized, sharp, tapering, pointed labrum (fig. 7 *lb*) and a broader membranous epiphar-

ynx (fig. 7 *ep*) with irregular dentations at apex. The *maxillae* (fig. 7 *mx*) present an elongate basal part with a median longitudinal region strongly chitinized, a distinct palpifer from which arises the 5-segmented palpus (*mx. p*) and a small but distinct terminal lobe (*mx. l*). The *labium* (fig. 7 *li*) presents a basal sclerite in which, as in the maxillae, a strongly chitinized longitudinal region is conspicuous, in each half; the paraglossae are large thick, fleshy, concave on inner face, and show no signs of pseudo-tracheae; the fused glossae are represented by a very delicate median membranous lobe. The *hypopharynx* (fig. 7 *hyp*) is much like the epipharynx in condition being rather broad, and irregularly dentate at apex.

Platyura sp. Mouthparts essentially like those of *Sciophila*. Hypopharynx broadly triangular; maxillae with 5-segmented palpus and weak, spoon-like, terminal lobe as long as first palpar segment. Labium with free, elongate paraglossae; glossae fused to form a single, short, broad, median lobe.

Mycetophila (two species). The genus shows a specialization in its mouthparts distinctly beyond the conditions presented by *Sciophila* and *Platyura*. The maxillae have no lobes, and the maxillary palpi are 4-segmented. The labial lobes are all fused to form a single broad plate-like lobe, in which two large tracheal trunks (or pseudo-tracheal trunks) are visible.

SPATHULATE HEAD SETAE ON THE LARVA OF CHAMYRIS CERINTHA TREITS.

BY HARRISON G. DYAR, WASHINGTON, D. C.

I had occasion to notice spathulate head setae in the case of *Ciccinnus melsheimeri* (Journ. N. Y. ent. soc., iv, 92). A second instance is found in *Chamyris cerintha*, though here it is the first epicraneal seta that has become flattened instead of the fourth, and the structure disappears at the last moult. A condensed description of the last stage of the larva has been given by Mr. Coquillett (Papilio i, 56); but he does not refer to the spathulate hairs of the early stages. I assume the number of stages for convenience in indicating them; I do not know that seven is the true number.

Stage IV. Slender, anal feet divergent: head strongly bilobed, the lobes angular, the apex black with a line passing down both front and back lateral angles; green; seta i short, spathulate; width 1.2 mm. Body with joint 12 slightly enlarged; setae single, stiff, coarse, black; i, ii, iii, v, pointing sharply forward, iv and vi backward, all normal, seta iv behind the middle of the spiracle; leg shields small with few setae. Green; tubercle i on joints 5 to 7 enlarged and black; an obscure white lateral line above wart iii;

anal feet and a subventral dash on joint 12, crimson. The two anterior pair of abdominal feet are slightly weaker than the others.

Stage V. The same; a broken reddish line runs along warts i and ii, which are nearly in line; white lateral line distinct.

Stage VI. The same; the white lateral line is sharply edged; head green, the black lines fainter than before, seta i still spathulate.

Stage VII. Head more rounded, seta i no longer spathulate, very short; the lobes are low, not angular. Body slender, dorsum between the distinct white lateral lines filled in with dark vinous purplish, the subventral regions green. Setae coarse, long and black; tubercle ii on joint 12, and i on 13 large, high and conical, the others normal.

The line on the head is abbreviated, partly or wholly brown; width 2.5 mm. Abdominal feet essentially equal.

Food plants. Wild cherry and plum.

Larvae solitary, very active and quickly spring off of the plant when disturbed, like some Deltoids.

AN APPARENTLY NEW LECANIUM FOUND ON WHITE CEDAR.

BY T. D. A. COCKERELL AND G. B. KING.

This article is written by Mr. Cockerell, but is partly based on Mr. King's notes and observations.

When Mr. King sent me a small almost globose Lecanium found on White Cedar, I could hardly believe it could be anything

but a form of *L. fletcheri*, especially since he had found some veritable *fletcheri* in Massachusetts on arbor-vitae. A close examination of the Cedar scale, however, reveals differences which must surely be specific, so the insect is described herewith.

Lecanium pallidior, Ckll. & King, n. sp.

♀ *Scale*. 3 mm. long, 2 broad, $1\frac{1}{2}$ to 2 high, very convex, very shiny, wrinkled; light yellowish-brown or ochreous, paler at the sides than dorsally. This is a very much paler scale than *fletcheri*, and when boiled in caustic potash it becomes very pale and transparent, while *fletcheri* remains dark brown.

Antennae. Six-segmented, the segments measuring as follows in μ (1.) 34-51. (2.) 28-31. (3.) 42-45. (4.) 34. (5.) 23-31. (6.) 34-42. Mr. King reports a 7-segmented antenna, with the last three segments measuring respectively 12, 16 and 38 μ . This agrees well enough with *fletcheri*, which I find always to have 7 segments, the last three 14-20, 14-17 and 39-42 μ . There is also this in common with *fletcheri*, that the second segment is shorter than the first or third.

Legs. The different legs are similar in type, but the tibiae and tarsi are variable. Four legs measured gave as follows — (μ)

	(1.)	(2.)	(3.)	(4.)
Coxa	87.	85.	87.	85.
Femur + trochanter.	116.	116.	116.	118.
Tibia	110.	76.	82.	68.
Tarsus + claw.	65.	76.	90.	79.

The first is an anterior leg: These dimensions are very different from those of *L. fletcheri*, as will be seen by comparing the statistics given below.

Lecanium fletcheri, Ckll.

<i>Antennae</i> . (μ)	Segments.	1.	2.	3.	4.	5.	6.	7.
Mass. spn.		36.	34.	45.	42.	20.	17.	42.
Canadian spn.		42.	31.	48.	37.	14.	14.	39.

<i>Legs</i> . (μ)	Coxa.	Femur + troch.	Tibia.	Tarsus + claw.
Mass. spn.	113.	127.	87.	85.
Canadian; front leg.	56.	107.	90.	85.
" middle leg.	121.	144.	96.	93.
" hind leg.	130.	141.	93.	90.
" hind leg.	121.	130.	93.	96.

The front legs of *fletcheri* appear thus to differ appreciably from the other four as regards the coxa and femur. Both coxa and femur of the middle and hind legs are noticeably longer than in *pallidior*.

Lecanium pallidior was found by Mr. King at Methuen, Mass., Nov. 15, 1898, on small twigs of *Chamaecyparis thyoides* (L.). The leaves and small limbs were thickly covered at that date with young larvae. The species belongs, of course, to Eulecanium.

TWO NEW COCCIDS FROM BERMUDA.

IN January of this year, the writer in his search for coccids infesting green-house plants, observed a potted plant in one of the conservatories visited, trimmed quite close to its roots, and the remaining stumps well covered with a small clear white scale. The plant in question was recognized at once to be *Cycas revoluta*. Upon enquiry it was learned that this plant was imported from Bermuda last year. Some of the old stems with the coccids were taken for study. One of the species proved to be *Aspidiotus hederæ* Vallot, a very common species through the United States, and the other coccid was

new to the writer, who sent a mount and some of the scales to Prof. Cockerell for determination. He identifies it as *Aulacaspis elegans* Leon. Described as *Howardia elegans*, and only known hitherto from *Portici Italy*, on *Cycas revoluta*. The ♂ and ♀ scale are unknown. The species differs from typical *Aulacaspis* by lacking the circumgenital glands. The occurrence of this species is of much interest and the coccids of Bermuda are almost unknown. There are only two other species known to the writer recorded from those islands, *Mytilaspis citricola* Pack. on orange and lime trees, and *Chionaspis citri* Comst. on orange.

Geo. B. King.
Lawrence, Mass., Feb. 27, 1899.

PROCEEDINGS OF THE CLUB.

9 December, 1898. The 205th meeting was held at 156 Brattle St., Mr. J. W. Folsom in the chair.

Mr. S. H. Scudder gave a brief account of recent studies in the orthopteran genus *Schistocerca*.

Mr. C. C. Adams showed a male and two females of *Trithemis umbrata* in which one of the latter showed the secondary characters of the male. This led to a general discussion of cases in which either sex tends to assume the secondary characters of the other. Cases were mentioned in the Orthoptera, Coleoptera and especially Lepidoptera.

13 JANUARY, 1899. The 206th regular and 22d annual meeting (since incorporation) was held at 156 Brattle street, the President, Mr. A. P. Morse, in the chair.

Mr. C. C. Adams of Urbana, Ill., was elected a member.

Reports from the several officers were received and the following officers elected for the ensuing year:— President, A. G. Mayer; secretary, Roland Hayward; treasurer, Samuel

Henshaw; librarian, S. H. Scudder; members* at large of the executive committee, J. W. Folsom and A. P. Morse.

The address of the retiring president, on the Distribution of New England locusts, was next read. (See Psyche for February.) General discussion followed its presentation, in which comparison was made of the distribution of locusts with that of other insects, especially Lepidoptera.

With regard to *Junonia coenia*, Mr. W. L. W. Field stated that he had arrived at the conclusion from observations made some years ago that in Connecticut there are two sets, a migratory and a resident one.

Mr. Field exhibited a very pretty series of the Californian *Lycæna xerces*, at one time supposed to have become extinct.

In connection with remarks made at the last meeting with regard to the assumption by one sex of the secondary sexual characters of the other, Mr. R. Hayward showed two males of *Leptura laetifica*, in which the elytra were partially red, together with normal examples of both sexes.

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PSYCHE.

THE MOUTHPARTS OF THE NEMATOCEROUS DIPTERA, IV.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY, CALIFORNIA.

CULICIDAE.

Corethra sp. The mouthparts are of the short, usual Nematoceros type. The *labrum-epipharynx* (fig. 8 A, *l. ep.*) is strongly convex above, well chitinized, and pointed. *Mandibles* are wanting. The *maxillae* (fig. 8 A, *mx*)

the outer ones, the paraglossae, being more strongly chitinized than the inner median one, the fused glossae. The *hypopharynx* (fig. 8 A, *hyp*) is narrow and tapering, and finely fringed at apex.

I have examined also the mouthparts of pupae of *Corethra*, but the pupae

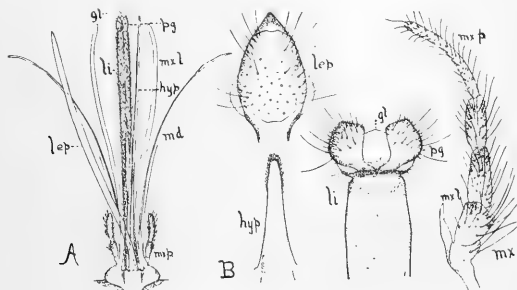


Fig. 8. A. Mouthparts of *Culex* sp.: *l. ep.*, labrum-epipharynx, *md.*, mandible, *mx.*, maxilla, *mx.l.*, maxillar lobe, *mx.p.*, maxillar palpus, *li.* labium *gl.* glossa, *pg.* paraglossa, *hyp.*, hypopharynx; B, Mouthparts of *Corethra* sp., same lettering.

have long 4-segmented palpi rising from a palpifer, and a short, delicate, very rudimentary lobe. The *labium* (fig. 8 A, *li*) has an elongate rectangular basal sclerite and three short terminal lobes,

were too nearly mature to present any instructive differences in mouthparts conditions.

Culex sp. The well-known mouthparts of *Culex* are markedly different

from those of *Corethra*. The mouthparts are very much elongated to form the long, slender, sucking 'proboscis. The females (fig. 8 B) which are blood sucking possess mandibles. The *labrum-epipharynx* (fig. 8 B, *l. ep.*) the *mandibles* (fig. 8 B, *md*) *maxillar lobes* (fig. 8 B, *mx. l.*) and *hypopharynx* (fig. 8 B, *hyp*) appear as long, slender pointed piercing stylets, which lie almost completely enclosed in the equally long, slender *labium* (fig. 8 B, *li*) whose lateral margins turn up and in so as to form a sheath, opening along the median dorsal line, for the stylets. The distal extremity of the labium is divided into three parts, representing the greatly reduced terminal lobes, paraglossae and fused glossae. Thus it is

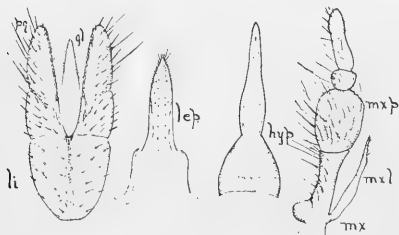


Fig. 9, Mouthparts of *Rhyphus* sp.: *l. ep.* labrum-epipharynx, *mx.* maxilla, *mx. l.* maxillar lobe, *mx. p.* maxillar palpus, *li.* labium, *pg.* paraglossa, *gl.* glossa, *hyp* hypopharynx.

the basal labial sclerite which is so elongated and which forms the sheath for the remaining mouth parts. The maxillary palpi are short (comparatively) and only 3-segmented. The

mandibles are finely serrate on the distal part of their inner margin.

The mouthparts of the male form a long, slender, proboscis-like organ, but there are no mandibles and the maxillar lobes are short and very delicate. The maxillar palpi are as long as or longer than the labium and are 4-segmented, the second segment being especially long. The labrum-epipharynx, hypopharynx and labium are as in the female.

RHYPHIDAE.

Rhyphus sp. *Rhyphus* has no mandibles, in female or male. The *labrum-epipharynx* (fig. 9, *l. ep.*) is elongate, triangular, pointed at apex, and bears a number of taste pits (?) on its under (inner) or epipharyngeal surface. The *maxillae* (fig. 9, *mx*) present a delicate, flattened, membranous, rather long lobe, and 4-segmented palpi. The *labium* (fig. 9, *li*) shows an interesting condition: the basal sclerite has a median longitudinal line, and there are three terminal lobes; the outer or paraglossae are 2-segmented and the narrower, pointed, median one, representing the fused glossae, is nearly as long as the paraglossae and free for its whole length. The *hypopharynx* (fig. 9, *hyp*) is especially well chitinized: it is sharp pointed, and the pharyngeal skeleton at its base is well developed.

BIBIONIDAE.

Bibio sp. *Bibio* sp. presents a similar

condition in males and females. Mandibles are wanting. The labrum-epipharynx (fig. 10 *l. ep.*) shows readily its composition of two parts; a labrum which has a bifid apex projecting beyond the epipharynx which bears a number of taste-pits (?) and is single pointed. The maxillae (fig. 10 *mx*) are strongly chitinized and consist of basal sclerite and five-segmented palpus (the basal segment is short and small, but appears to

the paraglossae and unusually strongly-chitinized.

Dilophus sp. A female of *Dilophus sp.* examined shows essentially the same mouthparts condition as *Bibio*. That part of the maxilla called basal segment of the palpus, in the description of *Bibio*, appears in *Dilophus* rather to be the palpifer.

Scatopse sp. In *Scatopse sp.* a remarkable degree of specialization is shown in the great reduction of the maxillary palpi. The palpi are composed of but one segment, which is borne by a slender, well-chitinized basal maxillar sclerite. The palpar segment is peculiarly pitted, and the inner surface of the segment is concave; in each of the pits or depressed spaces, there is a number of delicate short papillar processes. This reduction of the palpus to a single segment is not elsewhere shown (to my knowledge) among the Nematocera although it is the characteristic condition among the more specialized Brachycera. The labrum-epipharynx, labium and hypopharynx are present in *Scatopse* and in no essentially different condition from that of *Bibio*. The paraglossae of the labium are rather long and slender and with a strongly chitinized supporting basal part.

TIPULIDAE.

be a palpar segment rather than a palpifer). There is no maxillar lobe, unless a short well-chitinized spur (not shown in the figure) which lies interior to the palpus is a rudiment of the lobe. The labium (fig. 10 *li*) is short and broad presenting two well-developed, free paraglossae but no glossa. The paraglossae are fleshy and concave internally with infolded margins, and provided with numerous hairs and peculiar little rugose spaces. No pseudotracheae are visible. The hypopharynx (fig. 10 *hyp*) is well-developed, extending to the tip of



Fig. 10, Mouthparts of *Bibio sp.*; *l. ep.* labrum-epipharynx, *mx.* maxilla, *li.* labium, *hyp.* hypopharynx.

In this largest of the Nematoceros families we have a considerable variety of mouthparts conditions, and in the

conditions presented by the labium especially we find an extremely instructive series.

Symplecta punctipennis. This Tipulid presents mouthparts of the usual Nematocerous type, although of a specialized condition of that general type. This specialization is shown in the absence of mandibles and the reduction of the maxillar lobe to a minute, hardly chitinized rudiment. The *labrum-epipharynx* is rather short, and with chitinized skeletal frame work. The *maxillar*

The *labium* (fig. 11 S, *li*) is composed of a narrow well-chitinized basal sclerite with free paraglossae which are rather thick, with concave inner faces and bear numerous short strong hairs, and many short fine prickly hairs. A glossa is not visible. There are no pseudotracheae.

Dicranoptycha sp. Here we meet a condition similar to that shown by *Symplecta*. The maxillar lobe is better developed, being a distinct, spoon-shaped, weakly chitinized plate. The labium has free paraglossae, fleshy, with concave inner faces, and without sign of pseudotracheae.

Holorusia rubiginosa. In this giant Tipulid, we find a specialization in the mouthparts over the conditions presented by *Symplecta* and *Dicranoptycha* shown especially, and most suggestively, in the character of the labium. The basal sclerite of the *labium* (fig. 11 A, *li*) is very narrow and slender although well chitinized anteriorly, and the paraglossae are no longer free but are

fused for two-thirds of their length, forming a single large flat (though rather thick and fleshy) plate, in which a few conspicuous main-pseudo-tracheal trunks, and numerous very delicate and inconspicuous small versal pseudo-tracheae are visible. The *maxillae* (fig. 11 A, *mx*) have only a minute, membranous vestige of a lobe; the

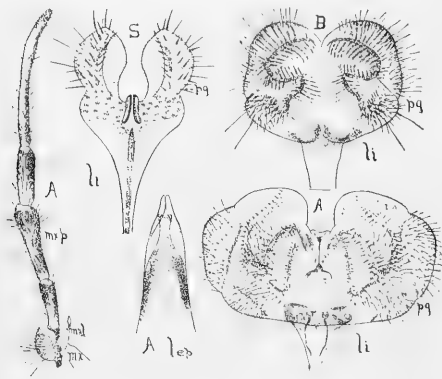


Fig. 11, A, Mouthparts of *Holorusia rubiginosa*, *lep*. labrum-epipharynx, *mx*. maxilla, *mx.l*. maxillar lobe, *mx.p*. maxillar palp, *li*. labium, *pg*. paraglossa; B, Labium of *Tipula sp.*, *pg*. paraglossa; S, Labium of *Symplecta punctipennis*, *pg*. paraglossa.

palpi are long, 4-segmented and borne on a short palpifer. The *hypopharynx* is slender, with pointed fringed apex.

palpus, borne on a distinct, swollen, palpifer, is long and 4-segmented. The *labrum-epipharynx* (fig. 11 A, *l. ep.*) is short and well chitinized. The *hypopharynx* is short and pointed.

Stygeropsis *sp.* This genus has the mouthparts in the same general condition as *Holorusia*. The maxillae however present no trace of lobes. The paraglossae of the labium are fused for about half their length, are heavily chitinized at the outer margins and have pseudo-tracheae, of the character of those in *Holorusia*, namely a few

large main trunks, and numerous small, inconspicuous, delicate, transversal ones.

Tipula *sp.* In *Tipula* (fig. 11, B, *ti*) the fusion of the paraglossae extends farther and the system of pseudo-tracheae is better developed, the transversal ones being larger and more distinct than in *Holorusia*.

The mouthparts of the Tipulidae are borne at the anterior extremity of an anterior prolongation of the head capsule. The mouthparts themselves are not elongated; the maxillary palpi, however, are especially longer and slender.

A NEW LITHOSIAN.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Ozodania *n. gen.*—Head prominent, tongue distinct, coiled; male antennae simple; no ocelli. Palpi slender, upturned, reaching to middle of front; legs moderate, hind tibiae with four spurs. Fore wings slightly over twice as long as broad; 12 veins, 7 to 9 stalked, the rest from the cell; hind wings with vein 2 remote from 3 the rest evenly spaced, 6 and 7 stalked, 8 joining the subcostal for two-thirds the length of the cell; outer margin excavate, the anal angle produced; anal hairs of male conspicuous but not reaching the end of the body.

Type the following:—

Ozodania schwarzi *n. sp.*—Fore wing blackish lead color, a broad upright orange yellow band resting on the lobe at inner angle where the color becomes crimson; a similar stripe along internal margin, scarcely attaining the upright band, touched with crimson at base. Hind wings reddish pink, costal margin yellowish, a minute or distinct leaden apical band. Thorax gray; vertex

of head, collar and patagia orange yellow abdomen pinkish red; legs gray and yellowish. Wings below with the gray ground color more or less replaced by reddish. In the Arizona specimen the gray parts are as on the upper side, but the pale parts red and broader; in the Mexican specimen the gray is reduced to a small apical and basal patch on fore wings and is absent on hind wings. Expanse 16 mm.

Two males, Oracle, Arizona (E. A. Schwarz); Rancho Hannover, State of Vera Cruz, Mexico (H. Schwarz). U. S. National Museum, type number 4102.

This genus stands between *Cisthene* and *Odozana*. From the former it differs in the form of the hind wings and a slight enlargement on the outer angle of fore wings; from the latter, in the very slight development of the anal hairs and in the longer palpi (Walker says those of *Odozana* are correct and do not exceed the head).

This species must have been taken in

Mexico before. I can only account for its absence from the *Biologia Cent.-Amer.* by supposing that it has been confounded with *Cisthene unifascia*, which it greatly resembles in markings.

wings light orange. Antennae orange at the middle. Eyes pale greenish, not divided. Easily known from *A. anonae* Morgan, by the markings on the wings of the adult, and the lingua longer than the sperculum in the pupa.

T. D. A. Cockerell.

ALEURODICUS MIRABILIS.

Aleurodes mirabilis Ckll., Psyche, June 1898, p. 225. Prof. C. H. T. Townsend found this species in quantity at Minatitlan, Mexico, April 25, 1898, on the under side of Anona leaves. Fortunately, he secured a single ♂ adult, which shows that the insect belongs to *Aleurodicus*. The anterior wings are slightly over 2 mm. long, and about $1\frac{1}{3}$ mm. broad; white, with two very pale grey bands; the first crossing the wing just before the fork of the median vein, but interrupted for a space below the vein; the second a dilute transverse cloud not far from the apex of the wing. Body about 2 mm. long, exclusive of the forceps, which is about $\frac{3}{4}$ mm. Color of body and legs very pale yellow; base of abdomen white; thorax between

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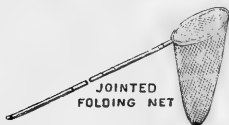
13 JANUARY, 1899 (cont.). Mr. J. W. Folsom said that *Isotoma besselsii* Pack. had not been recorded since its original description from specimens found in 1872 by the "Polaris" expedition in lat. $81^{\circ} 20' - 81^{\circ} 50' N.$, but that he had found this interesting collembolan in abundance last October on our own coast, occurring in large colonies under stones between tide-marks. Mr. Folsom added that his examples of this well-marked species agree perfectly with Packard's types, which he had already studied through the courtesy of the U. S. National Museum. A discussion followed as to the probable influence of ocean currents in disseminating maritime species.

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SUPPLEMENT TO PSYCHE, — I.

INSECT FAUNA OF THE GIANT CACTUS OF ARIZONA: LETTERS FROM THE SOUTHWEST.*

BY H. G. HUBBARD.

TUCSON, AR., Dec. 24, 1896.

"It is possible with some trouble to reach the nearest of the Giant Cacti (*Cereus giganteus*) on the hills about 2 miles to the south of here. In general there is absolutely nothing to be found on or about these great green posts which rise out of the hard ground like a stone monument in a grave yard, but on one occasion I found a cavity which was fairly alive with a rather large grey-colored Hemipteron (*Narnia femorata* Stal) evidently a plant-feeding species. The same cavity contained fresh seeds of the "Palo verde" (*Parkinsonia*), apparently carried in by a mouse or rat, and among these there were specimens of *Bruchus amicus*. I had also the luck to find one of the great cacti prostrate and entirely disintegrated and reduced to dust by the ants and termites. Under the debris of this I found quite a collection of insects: several pairs of the

large Monilema of this region (*M. giganteum* Lec.), and a numerous colony of Lampyrid larvae † and their cast skins, and also the larva of a Collops. There are also numerous fragments of Tenebrionidae (*Asida*, *Nyctobates*, *Eleodes* etc.) and Lamellicornia (*Diptotaxis*, *Listrochelus*, *Euphoria* etc.) under this debris but none of these can be found alive at this season.

TUCSON AR., Dec. 26, 1896.

"Yesterday being Christmas I made an expedition to the nearest hill about 2 miles south of here, and the first giant cactus which I reached proved to be a veritable bonanza. It was a grizzled old trunk some 15 feet in height, and as it stood close to a wood chopper's road it had fortunately been chopped by somebody's axe and had on one side a cavity about as large as my hat. This cavity was partly filled with black rotten material, and I found at the first examination that this debris was literally swarming with insects. The rotting was constantly advanced by great numbers of huge dipterous maggots (*Volucella avida* O. S.), aided by

* These letters were addressed to the undersigned and are now, after the death of the lamented author, published without alterations, except that a number of determinations wherever these were not furnished by Mr. Hubbard, have been inserted. These determinations were made by the specialists attached to the U. S. National Museum. Some of the new species of Coleoptera are described in the Appendix.—*E. A. Schwarz*.

† The imago subsequently bred, proved to be *Lycaina discoidalis* Horn.

several small species (*Ceratopogon*, *Limosina*, *Scatopse*, *Drosophila*), and all parts of the mass were overrun with Coleoptera. The desiccated hard part produced two species of small Calandridae (*Cossonus hubbardi* Sz., n. sp. and *Apotrepus densicollis* Casey), and also a few specimens of both Scydmaenidae (*Eumicrus lucanus* Horn) and Pselaphidae (*Tyrus elongatus* Brend., *Trinium puncticolle* Lec.), numberless small Aleocharinae and a few Trichopterygidae (*Trichopteryx*, two apparently undescribed species). The moister parts were alive with Hydrophilidae, both large and small (*Dactylosternum cacti* Lec., *Pelosoma capillosum* Lec., *Cryptoleurum cerci* Schwarz, n. sp.) and small Histerids of various species (*Paromalus opuntiae* Lec., *consors* Lec., *gilensis* Lec., *Acrilus arizonae* Horn). There were in numbers two large Styphlinidae, a Philontid with large head and red elytra (*Belonuchus ephippiatus* Say), the other a monstrous Aleocharid, the largest I ever saw (*Maseochara semi-velutina* Solsky). Besides these there were countless smaller Aleocharids (*Maseochara opacella* Sharp, *M. puberula* Casey, *Apheloglossa rufipennis* Casey, three or four species of Homalota, a Falagria and an undetermined genus). Among the Dipterous larvae, and apparently feeding upon them, were several perfectly huge Histerid larvae, over an inch long, and to-day on returning I found the imago (*Hololepta yucateca* Mars.) deeply buried in the very heart of the trunk and always in

the galleries of the large Calandrid *Cactophagus validus* Lec. Of this Calandrid I have not found the imago, but its larva resembles very much that of *Rhynchophorus cruentatus*. Among other Staphylinidae found in the moister portions of the pulp there are three Tachyporids, one very large (*Physetoporus grossulus* Lec.), and the two other rather small (*Erchomus convexus* Er. and *E. punctipennis* Lec.); a few specimens of *Xantholinus dimidiatus* Lec., *Lithocharis tabacina* Casey, very abundant, and rarely a species of Omalium (*O. cacti* Schwarz, n. sp.)

I took home yesterday a sack-full of the débris, and all this morning I was occupied in examining it, and every time I opened the sack I found something new. Some of the small Rhynchophora I could not have discovered in the field; they are as difficult to see as a Micropeplus among old leaves, although they are much larger and live in burrows in the hard outer crust. In the dry débris there is also *Ditoma gracilis* Sharp, not rare, *Ditoma sulcata* Lec., common, and a larger Trogositid (*Alindria teres* Melsh.), very rare; there were also a few specimens of a reddish Tenebrionid (*Ulosonia marginata* Lec.); a narrow species (*Cynaenus angustus* Lec.), two smaller Hololeptas (*H. cacti* Lec. and *vicina* Lec.), and a minute Staphylinid (*Oligota* n. sp.).

It is very singular that in this fermenting cactus pulp the interior of which was saturated with moisture I

did not find a single Nitidulid beetle either in the larva or adult. Of insects belonging to other orders, there is quite abundant in the pulp of the giant cactus a Forficulid (*Spongophora brunnei-pennis* Serv.) and two Pseudoscorpions (*Chelifer* n. sp., and *Chelanops* sp.).

It is evident that the giant cactus, whenever it is injured, furnishes a retreat and food for a very large fauna of insects, especially Coleoptera. The trouble is to find one which is attacked at all by insects.

TUCSON, AR., Dec. 28, 1896.

I have to add to my last letter an interesting discovery which I made this afternoon in continuing my study of the fauna of the giant cactus. It is stated that a small owl makes its nests in holes which are excavated in the trunks of this cactus by a woodpecker and I have frequently noticed that holes are seen in the trunks 8 or 10 to 15 feet above the ground. To-day I cut down with my hatchet one of these great plants in which was a perforation far above my reach. On examining the fallen trunk I found the hole contained abundant excrement of some bird but no nest. However, there were some curious ticks which remind me of the *Ornithodoros* of the Gopher tortoise of Florida and which I suspect to be parasites of the bird that made and used the hole. More interesting still it was to find that the hole gave admission to the insect fauna of the cactus, principally to the great *Cactophagus* larva

which ploughs its long galleries into the woody skeleton of the plant and which is followed by the immense dipterous (*Volucella*) maggots and all the multitudinous insects that follow in their train, among their number perhaps the most important being *Dactylosternum cacti* and its larvae. The depredations of these insects cause the rotting of the cactus especially within the internal bundle of woody rods which alone enables these gigantic plants to uphold their great weight. Even this woody bundle is perforated and entirely blackened and rotted, while the whole interior of the plant becomes a yet black mass of the consistency of soft mud. The cactus thus attacked sends out branches just below the wound in the exterior, and the first result is that the huge trunk breaks apart at that point and the upper portion falls at length to the ground. It is this process that produces the numerous examples of these cacti in which the upper half of the stem is missing, while the older portion supports a number of great branches. Without the intervention of the bird in making its burrow the insect fauna of the cactus could never exist; for no insect can penetrate the tough and silicious rind of the plant. It is most remarkable how quickly the plant repairs a casual wound extending into its pulpy exterior. The wounds made Saturday afternoon with my hatchet are to-day (Monday) so hardened on the exterior that no ordinary insect could effect an entrance. The surface already presents an incipient

crust which ultimately becomes a woody layer one-fourth an inch thick and so hard that it resists the blow of a sharp hatchet and turns the edge of a knife. In the deep holes made by the birds the sunlight and air are excluded, and perhaps the caustic action of the birds' dung keeps an open sore which the fly maggots soon convert into a rotting mass. When one considers the great numbers of insects which are dependant upon this cactus it is not a little remarkable that their existence should depend for the most part, if not entirely, upon the operation of a bird.

I made my first discovery of this fauna upon Christmas day, and being unable to complete my examination in one afternoon I took home with me a part of the disintegrated contents of the rotten spot which formed a hollow that would hold perhaps a half a peck. The next day I revisited this cactus and brought home with me more of the rotten contents, and although I have spent one whole day and two half days in examining this material and picking out the insects in my room I have not yet finished. Of the many thousands of larvae I have secured and preserved a good series. I do not think that in all my experience I have ever found so many different species of Coleoptera in one confined space, and as I have practically examined but a single cavity there is no knowing how many more species remain to be discovered. I have noted 30 distinct species of Coleoptera upon a superficial examination and I know that there are several others overlooked in the mass.

TUCSON, AR., Jan. 3, 1897.

Since I last wrote I have been following up the insect fauna of the Giant cactus. These plants grow only on the rocky hillsides, and although there are many of them in the aggregate they are generally a long way apart, and it requires much climbing over rocks to reach them. Sometimes there is a family of them together, but they are more often many rods apart. The trouble is to find one in good condition for insects. I find many of them prostrated either by the prospectors searching for ores or by the wind but not one in several square miles is in the right condition, and I believe it takes a year for them to rot or dry up. Most often they are too old, and inside the split and hardened skin is only a mass of black dust and a great bundle of wooden rods. I have sifted these dry interior contents but found only the elytra of *Cactophagus validus* of which I have full grown larvae from the heart of the cactus. I will come upon the living imago some day. I found lately a huge trunk, cut down and partly rotten and filled with countless myriads of Staphylinidae, large and small, the little Histeridae, the Hydrophilidae, large and small, with Pseudoscorpions and flies by the millions. There will be fifty species at least of this cactus fauna; unfortunately some of them are extremely rare or hard to find in the swarming mass of small Staphylinidae. The most difficult to secure are the minute and very rare Pselaphids, Scydmaenids, Trichopterygids etc. These are found in the half dry parts on the edges of

the putrescent mass, but the skin of the cactus toughens in drying and has to be cut apart with an axe, and of course in such violent handling all the fine things are lost. I have secured some of these small species in one or two specimens; one of these is an *Holoparamecus* (*H. pacificus* Lec.). Of the two species of Trichopteryx mentioned before I have a fair series. Yesterday, there turned up in considerable numbers a small, shining brown Cryptophagid (*Ephistemus cactophilus* Sz. n. sp.), very similar to that we found at Crescent City under decaying weeds. The minute new Oligota with red elytra was also very abundant. There is further a great Staphylinid, a most beautiful fellow, with the body blue black except the two last segments which are bright orange (*Xanthopygus cacti* Horn). It is as wild as *Listrotroplus cingulatus*. I have found it twice and got three or four specimens each time.

My most interesting discovery in the giant cactus is contained in some pieces of cactus pulp which I mail with this, nearly dry and quite hard. These came from a cavity in a giant cactus which had been excavated by birds. In these hardened crusts which were hanging in the cavity like bits of dry meat, there breeds a most marvellous Scolytid beetle of a genus quite unknown to me, with a long horn on the head of the male. This horn is double but united until near the extremity where it is parted and the tips are oddly pointed (*Cactopinus*

n. g., *hubbardi* Schwarz n. sp.) I notice that in the mature specimens the horn projects forward but all immature males have the horn curved back over the thorax. I have taken about 300 specimens, also larvae, but it took an entire day to get them out. I never saw them before, although I have examined crusts from many holes.

The fact is there must be a certain amount of moisture in the crusts; if the pieces are stone hard as they usually are these Scolytids cannot excavate. A cavity in this condition does not occur very often, and I do not feel sure that I shall ever find the like again. It is for this reason that I took a good supply of this Rhinoceros Scolytid of the Giant Cactus. In these or similar crusts I find occasionally the small Calandrid *Apotrepus densicollis*, difficult to see in the débris by reason of its dark color and rough sculpture. I have the larvae of that also. There is finally a small red, hairy Clerid larva penetrating these crusts and feeding upon the larvae of the Scolytid but I have not yet found the imago.

I find also that the flat Opuntias (*O. engelmanni*) on the hills near the giant cacti sometimes have rotten hearts in the main stem filled with the large Volucella larvae, *Belonuchus ephippiatus* and the Aleocharinae of the giant cactus. I even found *Holo-lepta yucateca* in one such stem, and perhaps the larger part of this fauna may be found in such places.

TUCSON, AR., Jan. 15, 1897.

Yesterday the sun came out between

clouds, and I seized the opportunity to get up in the hills among the giant cactus. I found a mountain side covered with cacti of the utmost variety with the Giant *Cereus* by thousands. There were, however, few of the latter with large cavities, and it was only after prolonged search that I found one immense fellow the lower three feet of which was entirely dead, even the heart and all around, but this part was quite dry, and the skin hung in patches upon the wooden axis. Only a small corner was wet and putrescent, and this presented in part the usual fauna but nothing new. *Physetoporus grossulus* was especially abundant. There was one specimen only of *Xanthopygus cacti*, and of course I secured that. It is strange that there were no *Rhynchophora* in this stem, and the upper part of the latter with three huge branches was quite sound and still alive. I saw two other plants of the giant cactus still standing although quite dead and dry. I sifted the debris of one of these in the hope of finding *Pselaphids* but there was nothing but a few *Poduras* and *Forficulas*. There must be a fatal rot, which, like a tuberculosis, entering at some woodpecker hole lays low these giants. Evidently they take years in dying. There is a large yellow *Polistes* (*P. flavus* Cr.) which hangs its comb in some of these cavities, and I find not seldom the hibernating wasps. Besides the *Narnia femorata* mentioned before, several other large Heteroptera (*Sinea raptoria*, *Diplodus luridus*, *Dendrocorus contaminatus*, *Brochymena ob-*

scura) are found hibernating in these cavities and some of these are probably feeding on cacti later in the season. I also found a colony of termites (*Termes flavipes*?) burrowing in the hard crust of the cactus in a woodpecker hole.

TUCSON, AR., April 22, 1897.

The entire mesa at the foot of the Sta. Catalina Mountains near Sabina cañon, about 18 miles northeast of Tucson, is covered for miles and miles with immense giant cactus, in one unbroken army, as thick as mullein stalks in an eastern cattle pasture. Out of these thousands of cacti I did not discover a single plant that was diseased or rotting, and only near the camp a few of the trunks had been overturned. This seems to me to indicate great longevity in the *Cereus* since among so vast an assemblage many dead and dying plants would be found if their period of life was not a long one. Also I think it gives weighty evidence as to the correctness of my surmise that disease and rot in this plant is started chiefly by the disorganization produced in the woodpecker holes by rain water acting on the dung of animals that lodge in these holes. In this vast forest of stalwart plants, woodpecker holes are of course comparatively rare since the plants outnumber the woodpeckers of this region very many times. Around Tucson where the cacti are far less abundant on the hill sides, a great many of the trunks are pierced with holes, and a comparatively large proportion die of this black rot, which

is aggravated by the attacks of insects. I have reexamined some of the fallen trunks which I visited last January and found several that were affected by rot and which had been cut down since I visited them at that time. The usual fauna was there but in less variety than I expected to find, and of the rarer species I did not observe a single specimen. I have reason to believe that when this black rot is once started it progresses quite rapidly and in the case of a fallen trunk it soon completely takes possession. On the other hand many fallen trunks not affected by the rot remain alive and sound for very many months and perhaps for one or two years, even if they are cut or split badly in falling, as is generally the case on stony hillsides. I visited one trunk which I myself had cut down in January last and which I had chopped and hacked into the very heart with a hatchet and in numerous places. The wounds which I had made and the deep splits made by the rocks among which the giant trunk had fallen, were all scarred over and cicatrized without a sign of decay, and not a single insect had effected an entrance. The flesh remained sound and fully alive.

TUCSON, April 29, 1897.

I examined the other day a big cactus trunk which I cut down and thoroughly inoculated with cactus rot when I was here before. This was the famous trunk with a rotten cavity from which I got my first introduction to this fauna on Christmas day. I found the trunk

almost entirely consumed by the rot with which I had infected it. Other trunks which I had cut down about the same time without inoculation have not rotted and are still sound and green. This large rotten trunk is now in excellent condition and full of insects but they are for the most part of the commoner species only. *Belonuchus ephippiatus* was very abundant and also the smaller *Maseocharas*, *Holo-lepta yucateca* and the *Hydrophilids*. The large *Maseochara semivelutina* was not common as imago but its larva was there in considerable numbers. It is probable that many other species are now in larva also and the imagos are not common at this season. I found in this trunk, in the half dry flesh of the still standing stump, an abundance of *Apotrepus densicollis*, and among them I secured two more specimens of the new *Cossonus*; also *Alindria teres* and *Ulosonia marginata*, and finally a new member of this fauna, a small species of *Platydema* (*P. inquilinum* Linell) apparently undescribed and probably identical with the species I found in the nests of the *Dasyliro* rat (*Neotoma albigula*).

TUCSON AR. May 13, 1897.

Some of the Lampyrid larvae which I took in January from old and dry trunks of *Cercus giganteus* and which I kept alive ever since are now beginning to transform to greenish pupae, and one of those has disclosed the imago which proves to be *Lycaina discoidalis*. The other day I found a fresh

colony of the larvae in the same trunk and also a good series of imagos. Some of my larvae kept since January have shed so many skins that they are now only half the size they were at first. While I do not suppose that this Lampyrid is absolutely a cactus insect, it is as much so as many of the Staphylinidae. As I wrote before I have the larvae of *Maseochara velutina* or *opacella*; they are running free among the swarming insects in the rotten pulp, and I see no evidence of their inhabiting the puparia of the Volucellas.

The other day I tore to pieces a cactus stump that had rotted and dried up, and inside I found several cocoons of the large weevil *Cactophagus validus* that had no exit holes. I cut into one with my knife and found to my great surprise not only the chitinous fragments of the weevil larva but also about 90 specimens of a Colydiid beetle

(*Bothrideres cactophagi* Sz. n. sp), all imagos and all dead and more or less mutilated. Among them were 5 or 6 skins of a dermestid larva (*Attagenus hornii*) with a long thin pencil of hairs at the tail and long yellowish pubescence on the sides and beneath. There was no trace of the larva of the Bothrideres. I found on close inspection a small ragged hole at one end of the cocoon sufficient to pass out or in a Dermestid or Colydiid beetle. Another *Cactophagus* cell opened by me contained 55 species of the Bothrideres, a third 76 specimens, and still another cell contained a dead and moldy larva of the *Cactophagus* and only one dead imago of *Bothrideres*. Not a single specimen of *Bothrideres* in the whole lot is perfect. I would like to know what these *Bothrideres* are doing there in such numbers, as if they had been caught in a trap and died there.

APPENDIX.

DESCRIPTION OF NEW SPECIES OF COLEOPTERA.

BY E. A. SCHWARZ.

CRYPTOPLEURUM CEREI, n. sp. (family Hydrophilidae).—Broadly oval, convex, shining, sparsely pubescent above, piceous black, antennae, palpi and legs pale testaceous, elytra either entirely or only at apex reddish. Head finely and rather sparsely punctulate, second joint of maxillary palpi moderately thickened at middle, not inflated. Thorax, when viewed from above, with the sides not rounded but obliquely narrowing from base to apex; the inflexed portion separated from the dorsal surface by a distinct ridge; angle of the true marginal line slightly

behind the middle; base not margined; surface rather sparsely but evenly and finely punctulate, inflexed portion smooth. Elytral striae rather fine, not strongly punctured, distinctly impressed apically, less distinctly so toward the base, the two inner striae very fine, very finely punctulate and not impressed from the base to the middle; intervals flat, sparsely and finely punctulate. Prosternal area nearly opaque, moderately finely and quite densely punctulate; mesosternal area much longer than in *C. americanum*, coarsely but not very densely punctate; metasternum

shining, not impressed, finely and sparsely punctulate, sinuous elevated line fine but distinct.

Length, 1.6 mm.

Locality, Tucson, Arizona; type, U. S. Nat. Mus. (Collection Hubbard & Schwarz).

Described from two specimens found by Mr. H. G. Hubbard on December 30, 1896 in a decaying *Cercus giganteus*. The species is distinguished from *C. minutum* by its shining surface, the sculpture of the elytra, not inflated 2nd palpal joint, sculpture of metasternum and other characters. *C. americanum* agrees with *C. cerei* in the structure of the palpi but differs by the sculpture of the elytra and of the underside and by its much shorter mesosternal plate.

OMALIUM (Phyllostrepa) CACTI n. sp. (family Staphylinidae).—Moderately elongate, parallel, subdepressed, shining, piceous; mouthparts, antennae, sides of thorax, the larger portion of elytra and the legs reddish yellow; pubescence not obvious when the insect is viewed from above but quite conspicuous upon a lateral view.

Head as long as wide, slightly convex between the eyes, alutaceous, impunctate between the frontal impressions which are deep and shining, distinctly and sparsely punctulate behind, without impressions in front of ocelli; tempora not prominent, rounded and much shorter than the diameter of the eyes; labrum slightly emarginate in front; last joint of maxillary palpi fully twice the length of the preceding joint; antennae slightly longer than head and thorax combined, with a six-jointed club, but joint 6th is much smaller and narrower than joint 7, though considerable wider than joint 5; joint 2 slightly longer than wide; joint 3 at base narrower than joint 2 and about twice as long

as wide; joints 4 and 5 each as long as wide, joint 6 decidedly wider than long. Neck alutaceous without distinct punctuation.

Thorax distinctly wider than long; front margin truncate and hardly narrower than the base; sides regularly arched, front angles obtuse, not prominent, hind angles more distinct but likewise obtuse; a feeble depression along the sides in front of the hind angles; surface alutaceous, moderately finely, not densely punctate. Scutellum alutaceous with a few fine punctures.

Elytra at base decidedly wider than the thorax, distinctly longer than wide and about as long as the exposed portion of the abdomen; humeri distinct but rounded; surface more shining than the thorax, densely punctate, the punctures coarser than those of the thorax and more or less distinctly subseriately arranged; color reddish yellow with the base, the sutural space and the apex more or less widely infuscated. Abdomen subparallel, above and beneath alutaceous, with fine, scattered setigerous punctures.

Underside of head on each side of the gular sutures indistinctly rugose; prosternum alutaceous without distinct punctures; mesosternum alutaceous, not carinate; metasternum alutaceous and very sparsely punctate. Tibiae hairy on outer edge, the middle and posterior ones also with a few short spines. Fifth joint of hind tarsus slightly longer than joints 1-4 combined.

Length 2.6—2.8 mm.

Locality, Tucson, Arizona; type, U. S. Nat. Mus. (Collection Hubbard & Schwarz).

Described from many specimens found by Mr. H. G. Hubbard December 25, 1896 in decaying *Cereus giganteus*.

EPHISTEMUS CACTOPHILUS, n. sp. (family Cryptophagidae).—Rather narrowly oval, more narrowed behind than in front, very convex, shining, pale brownish red,

legs and antennae pale. Elytra beset with sparse, extremely short and inconspicuous hairs. Head very minutely and sparsely punctulate; thorax more distinctly but still very finely and sparsely punctulate; elytra less finely, sparsely punctate. Prosternum smooth; metasternum finely, sparsely punctulate; abdomen smooth.

Length, 1 mm.

Locality, Tucson, and Sabina Cañon (foot of Sta. Catalina Mts.), Arizona; type, U. S. Nat. Museum (Collection Hubbard & Schwarz).

Closely allied to *E. apicalis* Lec., but slightly smaller and less rapidly narrowing behind; it differs by its uniform pale color, distinct punctuation of the upperside and the pubescence of the elytra which, however, is barely visible under ordinary magnifying power.

I have seen many specimens found by Mr. Hubbard in decaying *Cereus giganteus* in December and January, and also found it myself under the same conditions in April 1898 at Catalina Springs, Ar. (foot of Sta. Catalina Mts.).

The Florida species mentioned by Mr. Hubbard is specifically distinct and remains undescribed.

BOTHRIDERES CACTOPHAGI n. sp. (family Colydiidae)—Elongate-oblong, brown, not densely pubescent. Head and thorax nearly opaque, the former densely, moderately coarsely punctate. Thorax longer than wide, widest shortly behind the front angles, which are prominent, hence narrowing towards the base; sides slightly arcuate, with a tubercle just behind the middle; surface coarsely, densely punctate, with two impressions along the middle: the anterior one

small, punctiform and sometimes obsolete, the posterior one deeper, smooth and shining at bottom and connected with the base of the thorax by a sharply limited triangular impression. Elytra somewhat shining, moderately convex in both sexes, rather finely striate, striae finely punctate, interstices finely uniseriately punctulate, alternating in width, the narrower ones more elevated, more pubescent and subcariniform toward apex. Prosternum coarsely and deeply punctate; abdomen anteriorly very finely and sparsely punctulate, toward tip a little more coarsely and more densely.

Length, 2.8—5 mm.

Locality, Tucson, Arizona; type U. S. Nat. Museum (Collection Hubbard & Schwarz).

I have seen several hundred specimens, all of them more or less mutilated. Slightly more elongated than either *B. montanus* or *geminatus* and distinguished at once by the form of the posterior dorsal impression of the thorax. The species was found by Mr. H. G. Hubbard within old cocoons of *Cactophagus validus* and is no doubt parasitic in, or predaceous on the larva of the Calandrid.

COSSONUS HUBBARDI, n. sp. (family Calandridae)—Form of body slightly less elongate, and much less shining above, than in any of the North American species referred to this genus; surface subdepressed (about as in *C. corticola*), color black, antennae and legs red. Beak longer than half the thorax, subdepressed, shining, extremely feebly dilated apically, the dilated portion longer than the basal portion, sparsely finely punctulate, basal portion coarsely punctate, the punctuation extending over the front to the hind margin of the eyes; front with a deep, oblong fovea extending to the anterior part of the vertex which is otherwise smooth,

slightly more convex than the front but not separated from it; antennae inserted at outer fifth of the beak, scape extending slightly beyond the hind margin of the eyes, first funicular joint about twice as long as wide, second joint slightly longer than wide, obconical, joints 3-7 transverse, gradually but not strongly increasing in width, club large, oblong-oval, opaque, pubescent, basal portion very little smoother than the apical portion.

Thorax very little longer than wide, sides straight from base to three-fourths of the length, then rounded and narrowing, apical constriction hardly perceptible; base sinuate each side of a short median lobe; surface extremely coarsely, densely cribrato-punctate, the interstices of the punctures broader and more shining on the disk than on the sides; a distinct depression anterior to the scutellum where a shining cariniform elevation may be seen, and, in front of this, a larger, equally shining rudiment of a smooth median line.

Elytra at base wider than the thorax, striate, the striae extremely coarsely punctate; intervals narrow, subcostiform, sutural interstice behind the scutellum depressed. Prosternum and mesosternum very coarsely and densely punctate; metasternum and abdomen less densely but also coarsely punctate. Front tibiae not sinuate at inner edge.

Length, 3.7-4.8 mm.

Locality, Tucson, Arizona; type U. S. Nat. Museum (Collection Hubbard & Schwarz).

I have seen only five specimens of this species which is readily known from all North American species of this genus (including *Borophloeus* Woll.) by its hardly dilated beak and the extremely coarse punctuation. It seems to be one of the rarest insects peculiar to the Giant Cactus.

CACTOPINUS, nov. gen. (family Scolytidae;

subfamily Tomicinae) — Body moderately slender, head subglobose, retracted into the thorax; antennae short, scape slightly shorter than the funicle, widening apically, convex at outer edge and here furnished with a few long setae; funicle 5-jointed; the first large, obconical, joints 2-4 small, increasing in width, joint 5 closely applied to the club and twice as wide as long; club oval, comparatively small, about as long as the funicle, sparsely pubescent on both sides and with two distinct straight, or nearly straight sutures. Clypeus, in the male, armed with a long process consisting of two cylindrical rods which are laterally connate except near the tip where a contraction and separation of the rods takes place.

Prothorax as long as wide or slightly longer than wide, rounded at the sides which are not margined; disk, in both sexes, with a longitudinal, tuberculated and distinctly elevated median area which projects beyond the base of the thorax as a triangular lobe.

Elytra with the basal margin not elevated, conjointly rounded at tip, surface punctate-striate, sutural stria distinctly impressed, declivity steep, with the sutural space declinate.

Prosternum very short in front of coxae, which are nearly contiguous. Abdomen horizontal, segments 1 and 2 of equal length, each about as long as segments 3 and 4 combined. Legs rather short, hairy; front tibiae narrow, very little dilated apically, outer edge not arcuate, neither denticulate nor serrate, slightly sinuate near apex, outer apical angle moderately produced laterally, terminal mucro straight and moderately slender; middle and hind tibiae slightly more slender than the anterior tibiae; tarsi short, joints 1-3 of equal length, joint 3 not dilated, joint 4 distinct, claw joint long and slender.

CACTOPINUS HUBBARDI, n. sp. — Elongate-oval, usually subopaque; the whole body, including the legs, beset with rather sparse, long erect yellowish hairs; color piceous;

antennae and tarsi paler; thorax and elytra usually covered with a peculiar incrustation (or exudation?)*

Head differing in sculpture according to sex, usually retracted into the thorax to beyond the eyes. Thorax about as long as wide at the middle; front margin greatly arcuate and fringed with short, dense, yellow hairs, anterior and posterior angles rounded, sides arcuate, base nearly straight; disk at middle with a longitudinal, tuberculated area which, commencing usually some distance behind the front margin of the thorax, becomes narrower toward the base, more and more abruptly elevated above the lateral parts of the thoracic disk, and finally extends beyond the base as a triangular, hood-like projection over the scutellum †; sides and inflexed flanks of thorax without distinct sculpture.

Elytra about $1\frac{1}{2}$ times longer than the thorax at middle, punctate-striate, the striae feebly impressed, punctures large; interstices narrow, convex, very finely uniseriately punctured, each with a row of long, erect or suberect long hairs, sutural interval gradually becoming deeper behind; declivity steep, convex at the sides, sutural interval deeply and broadly sulcate and limited externally

*This incrustation is always present in fully matured specimens and completely conceals the sculpture of the elytra, except that a few of the longer hairs always remain visible; on the thorax the tubercles of the median elevated area are never covered. In the more immature specimens the incrustation is less dense, and the above description of thoracic and elytral sculpture has been taken from such specimens. Upon immersion in chloroform the incrustation is dissolved, and the surface of the insect appears to be shining with thoracic and elytral sculpture much more pronounced. Dr. J. B. Smith writes me that the elytral structure indicates the possibility of excretory pores on the surface.

† The amount of individual variation, as exhibited in a long series of specimens, regarding the various features of this remarkable structure of the thorax is very great, and hardly two specimens can be found which precisely agree in all structural details. The variations refer more especially to the extent of the tuberculated area, the degree of its elevation, and to the form and size of the post-basal prolongation.

by the third interval which becomes cariniform and bears a row of five tubercles; fifth interval also with some tubercles; the suture itself being elevated at the bottom of the sulcus.

♂.—Front broadly and slightly concave, feebly pubescent, not distinctly punctate; clypeus armed with a broad and long horn-like process, usually as long as or longer (very rarely shorter or much shorter) than the thorax and which is composed of two nearly cylindrical rods which are laterally connate and of equal width from the base to near the tip. The anterior and posterior sides of the horn are shining and more or less distinctly tuberculate, the lateral margins are densely tuberculate and apparently irregularly serrate and furnished with a fringe of moderately long hairs. Some distance from the tip, each rod is angularly contracted laterally, and only the inner half of each is prolonged into a shining, cylindrical prong-like process averaging about one-eighth the length of the horn. The prongs are distinctly separated from each other, and the separation often extends more or less deeply into the apical portion of the horn. The outer truncature at the base of the prongs is usually inerm, but in all immature specimens, and often also in mature specimens, it is furnished with a spine-like, pointed process, as long or longer than the prongs. In some specimens this process is dissolved into two or more stiff setae. ‡

♀—Head unarmed, feebly convex, indistinctly punctured, covered with short, not dense, yellowish pubescence; front with a small, shallow impression which is smoother than the surrounding space.

Length, 1.7–2.2 mm.

Locality, Tucson, Arizona; types,

‡ In the living specimens the horn is carried straight forward; in the dead mature specimens, the horn is more or less vertical, while in all immature specimens it is recurved back over the thorax.

U. S. Nat. Mus. (Collection Hubbard & Schwarz).

I have seen several hundred specimens, discovered by Mr. H. G. Hubbard in the dry pulp of *Cereus giganteus*. All the specimens came from a single cavity in a decayed trunk, December, 1896.

This singular Scolytid is at once recognizable from the structure of the thorax and the remarkable cephalic armature in the male. Its affinities and systematic position have, however, remained obscure to me, and the elucidation of these points must be left for future studies.* Its food-habits and

mode of development also deviate from those of other Scolytidae. The dry pulp of *Cereus giganteus* in which this species lives is of a very peculiar nature and resembles certain species of hard Agarics more than a piece of wood. This pulp is extremely hard and brittle, and having examined several pieces sent me by Mr. Hubbard I fail to recognize any regularity or system in the borings of the beetle and its larva. Imagos, pupae and larvae are to be found indiscriminately scattered in the irregular chambers and galleries with which the interior of the pulp is honey-combed.

CLASSIFIED LIST OF SPECIES OBSERVED BY H. G. HUBBARD ON THE GIANT CACTUS.

BY E. A. SCHWARZ.

Hymenoptera.

Polistes flavus Cresson.

Coleoptera.

Dactylosternum cacti Lec., *Pelosoma capillosum* Lec., *Megasternum cerei* Sz., *Tyrus elongatus* Brend., *Trimium puncticolle* Lec., *Eumicrus lucanus* Horn, *Maseochara semivelutina* Solsky, *M. spacella* Sharp, *M. puberula* Casey, *Aphelogossa rufipennis* Casey, unknown genus of *Aleocharinae*, *Hoinalota* sp. sp., *Falagria* sp., *Oligota* n. sp., *Xanthopygus cacti* Horn, *Belonuchus ephippiatus* Say, *Xantholinus dimidiatus* Lec., *Lithocharis tabacina* Casey, *Physeto-*

porus grossulus Lec., *Erchomus convexus* Er., *E. punctipennis* Lec., *Omalium cacti* Sz., *Trichopteryx* sp. sp., *Ditoma gracilis* Sharp, *D. sulcata* Lec., *Bothrideres cactophagi* Sz., *Ephistemus cactophilus* Sz., *Attagenus hornii* Jayne, *Hololepta yucateca* Mars., *H. cacti* Lec., *H. vicina* Lec., *Paromalus opuntiae* Lec., *P. consors* Lec., *P. gilensis* Lec., *Acritus arizonae* Horn, *Holoparamesus pacificus* Lec., *Alindria teres* Melsh., *Lycaina discoidalis* Horn, *Clerid* larva (not bred), *Monilema giganteum* Lec., *Ulosonia marginata* Lec., *Cynaëus angustus* Lec., *Platydema inquilinum* Linell, *Cactophagus validus* Lec., *Apotrepus densicollis* Casey, *Cossonus hubbardi* Sz., *Cactopinus hubbardi* Sz.

Lepidoptera.

Melitara fernaldialis Hulst. Larva feeding on decaying pulp of the Giant Cactus. Imagos were bred by Hubbard and myself at Catalina Springs, Ar., in April 1898.

*Prof. A. D. Hopkins of Morgantown, W. Va., has consented to make a thorough investigation of this Scolytid. He has just now (February 13, 1899) forwarded to me a series of careful drawings illustrating the structural details of *Cactopinus*, but I am unwilling to anticipate the conclusions derived from his studies. Dr. J. B. Smith has also kindly prepared sketches and microscopic slides illustrating the mouthparts and other details.

Diptera.

Ceratopogon sp., Scatopse sp., Volucella
 avida O. S., Nerius flavifrons Big., Drosophila sp., Limosina sp.

Orthoptera.

Spongophora brunneipennis Serv.

Neuroptera.

Termes flavipes Koll.?

Heteroptera.

Brochymena obscura H. S., Dendrocorus
 contaminatus Uhler, Narnia femorata Stal,
 Sinea raptorica Stal, Diplodus luridus Stal.

Acari.

Gamasidae (two species obtained from
 rotten cactus pulp sent by Hubbard to Wash-
 ington).

Pseudoscorpionidae.

Chelifer n. sp., Chelanolops sp.

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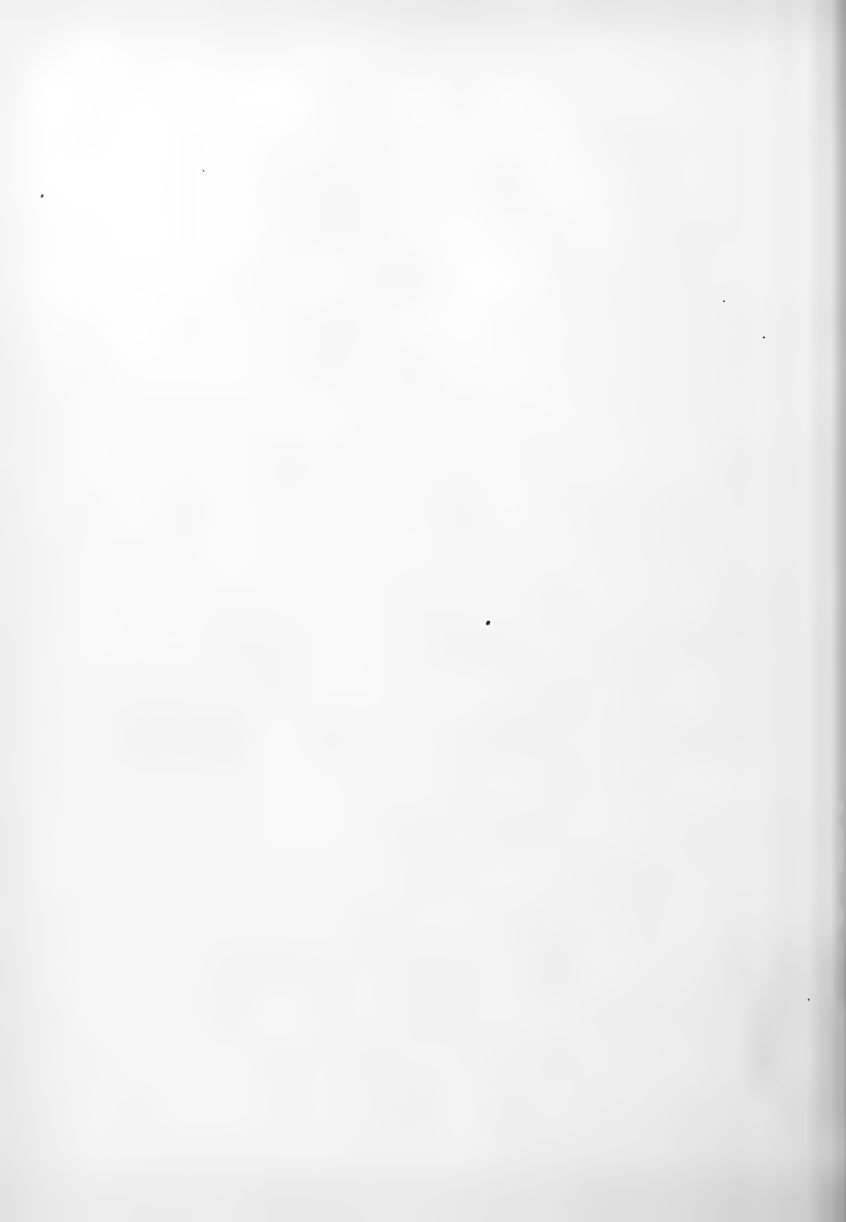
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PSYCHE.

THE MOUTHPARTS OF THE NEMATOCEROUS DIPTERA, V.

BY VERNON L. KELLOGG, STANFORD UNIVERSITY.

RESUME.

Having examined the mouth structure of representatives of all (except one) of the families of Nematoceros Diptera we are in position to state in general and inclusive terms the characters of the mouthparts of the Nematocera.

The mouthparts are composed of (retaining the nomenclature heretofore used) a labrum-epipharynx, a pair of mandibles, wanting in the males of all families, and wanting in both sexes of a few families, a pair of maxillae, in which never more than one terminal lobe is present, and this failing in a few instances, and a labium, whose palpi are totally lost, and whose terminal lobes show a considerable range in degree of coalescence. The condition of the various parts may be described in more detail as follows:

The labrum-epipharynx is always present and always free; it is longer than broad, pointed though not always sharply, and, as seen from above, well-chitinized. It is composed of two

lamellae (often separable by dissection, or by treatment with potassium or sodium hydrate) of which the upper or dorsal one is a well chitinized sclerite and is the labrum *s. str.* The lower or ventral one is a thin membranous structure, often projecting slightly beyond the labrum and in almost all cases bearing few or numerous taste pits (?) and papillar sense (?) hairs.

The mandibles are, when present, possessed only by the females; they are wanting in both sexes in six of the eleven families studied. The mandibles in the five families possessing them are always free and distinct but show very obviously their tendency toward reduction and disappearance. In their best developed and certainly effectively functional condition, they are long, slender, well-chitinized and armed with a fine but conspicuous dentation along their inner margin. From this condition they descend by quick steps to the condition of small thin weakly-chitinized delicate plates, practically functionless.

The maxillae are always free except at their very base: they possess a basal sclerite, never separable into cardo and stipes, a palpus always well-developed and 4 or 5-segmented, and a single maxillar lobe, which is wanting in a few cases. When present, this lobe is a slender, elongate, weakly-chitinized, thin, flat, process, with pointed and "fringed" apex. It shows gradual degrees of reduction to total disappearance.

The labium is a free, short (but little longer than broad) under lip, with basal sclerite only rarely showing indications of its composition of two parts (sub-mentum and mentum) and with terminal lobes showing various degrees of coalescence with each other. The base of the labium is in some instances united by membranes with the bases of the maxillae. Palpi are always wanting; no unmistakable indications of them are to be found, although in two forms examined, what may be palpar rudiments are present. The terminal lobes in freest condition consist of the two free paraglossae sometimes apparently 2-segmented, and a median, always delicate, membranous lobe representing the fused glossae. The paraglossae when free, as is the condition in almost all the Nematocera, show no indications of pseudo-tracheae and are rather thick, concave on their inner faces, and more or less thickly beset with hairs of varying size and strength. In one family the paraglossae tend to coalesce, and within the limits

of this one family (the Tipulidae) the paraglossae may be found free, partly coalesced and coalesced almost completely. With the beginning of coalescence, appears the first indications of pseudo-tracheae, and in the nearly completely coalesced condition, the system of pseudo-tracheae is well developed.

The hypopharynx is probably always present (in one or two instances I have been unable to dissect it out satisfactorily on account of its minute size and delicacy). It is a delicate, membranous, elongate, pointed plate, in which the course and opening of the salivary duct can usually be seen. It is always free from its base, arising from the inner (upper) wall of the labium to its tip.

HOMOLOGIES AND PHYLOGENY.

The homologies of the various mouthparts within the group Nematocera seem obvious and certain. The differences between the mouthparts of Blepharocera, Simulium, and Ceratopogon in which mandibles and a functional maxillar lobe are present, and the mouthparts of Bibio and Tipula in which there are no mandibles and no maxillar lobe is simply one of degree of specialization by reduction. Similarly the single, broad lobe with elaborate system of pseudo-tracheae which constitutes the labium of Tipula simply presents the extreme degree of coalescence (as reached among the Nematocera) of the outer terminal labial lobes, the para-

glossae, which in *Simulium*, *Rhyphus*, *Dixa*, and even in *Symplecta* (a Tipulid) are free and distinct, and without sign of pseudo-tracheae. The gradual coalescence of paraglossae is seen plainly in *Mycetophila* and among the Tipulids, and the gradual appearance of the pseudo-tracheae can be readily traced in the Tipulid family. The general tendency of specialization of the mouthparts of the Nematocera is toward the reduction and loss of the mandibles and maxillae, and toward the special development of the labium to be a rasping, lapping organ, all-important in food taking. The physiological change in food habit from blood-taking or sap sucking, which demands piercing and elongate sucking parts, to the lapping of exposed liquids or the taking of solid food in small rasped-off particles mixed with a salivary or other secreted fluid, has been accompanied by the general structural change already indicated.

Now, is the highly specialized mouth of the Muscidae and other similar Brachycerous Diptera reducible to the Nematocerous mouth? Can the parts of the mouth of *Musca* be homologized with the parts of the Nematocerous mouth? To display the evidence which the comparative anatomy of the mouthparts presents touching the point will require another paper. It is necessary to present the gradations between the most specialized of the Nematocerous mouths, say that of *Tipula*, and the mouth of *Musca*. I may only say here that to any one at all acquainted with

the Dipterous mouthparts this will not be taken to be a very difficult matter.

Finally, can the Nematocerous mouth be reduced to the orthopterous, biting type of mouth? Are the so-called mandibles, maxillae and labium of *Blepharocera* or *Ceratopogon* homologous with the mandibles, maxillae and labium of a cockroach? Unfortunately there is no persistent racial genus of flies with orthopterous mouthparts, like *Eriocephala* among the Lepidoptera. The persistence of *Eriocephala* enables the development of the highly specialized mouth structure of the butterfly to be traced backward through the higher moths, through the Tineids, and finally through *Eriocephala* directly to the orthopterous type. Comparative anatomy can here unaided satisfactorily reveal the homologies.

But with the Diptera the most generalized mouth is far from the orthopterous type. And yet it seems not unreasonable, nor violently imaginative to see in the mouth of *Blepharocera*, the modified but still recognizable mandibulate mouth. However, a study of the development, the ontogeny of the mouthparts of some Nematocerous form is necessary to present the needed confirmation of this supposition, and this testimony of the ontogeny I hope to present in some future paper.

As said at the beginning of these notes, the scope of this paper is limited to the study of the comparative anatomy of the mouthparts of the Nematocerous Diptera.

ARKANSAS MELANOPLI. — III.

BY JEROME MCNEILL, FAYETTEVILLE, ARK.

Melanoplus impiger Scudd. — This is a not uncommon species among vegetation in the sandy bottoms and along the banks of streams. I have captured full grown specimens as early as the seventeenth of July and as late as the twenty-sixth of October. These specimens seem to be quite typical. Sixteen males, twenty females from Washington, Crawford, Sebastian, and Marion counties.

Melanoplus keeleri Scudd. — A variable species occurs commonly in Arkansas and farther north which after much hesitation I have decided to consider *Mel. keeleri*. I have specimens from Washington, Crawford, Sebastian, Madison, Newton and Marion counties and from the Indian Territory and while they vary little in size and color there is such great difference in proportion and shape of parts that following Scudder's key individuals fall in either of three closely related species, *Mel. keeleri*, *delector* and *luridus*. To illustrate the amount and character of this variation, I have five males from Fayetteville, one has the median carina of the pronotum percurrent on the prozone and distinct, a second has it percurrent but indistinct, a third has it entirely obsolete between the transverse sulci, the last two have no trace of it on the prozone. All of these specimens have the space between the mesosternal

lobes three times as long as wide; but four males from Cane Hill in the western part of Washington County have the space between the mesosternal lobes four times as long as wide, and in the median carina they are quite constant, there being but a faint indication of it before the first sulcus. Three other males from Fort Smith, Gaither, Newton County, Ark., and Mackey, I. T. have the median carina percurrent and distinct on the prozone but the second and third have the space between the mesosternal lobes two and one half times as long as wide while the first has this space little if any longer than broad. The cerci are very like those of *Mel. luridus* as figured by Scudder but they differ much in color and appearance from typical specimens from Nebraska. The furcula is very small, in one case apparently obsolete, and very divergent. My specimens are indistinguishable in size and color from Illinois specimens which Scudder considers *Mel. collinus*. On the whole it seems to me to be highly probable that the four species named above are merely varieties of one widespread species and accordingly I give the Arkansas specimens the oldest name.

Melanoplus atlantis Riley. — This widely distributed species is rather more common than *Mel. femur rubrum*.

Specimens with red hind tibiae are about as common as those with green legs. My collection contains thirty-nine of the former and forty-two of the latter. Difficulty is frequently experienced in distinguishing red leg females from those of *Mel. femur rubrum*. The weakness of the median carina on the prozone, the length of the tegmina and their more distinct maculation are all useful characters, but I have found the sharpness of the prosternal spine a good guide when other distinctions failed.

Melanoplus femur-rubrum De Geer.—This species is abundant in meadows and pastures. Short winged females are somewhat difficult to distinguish from *Mel. impudicus* but the last mentioned species may be known by the fact that the second sulcus of the prozone is twice as distant from the third as from the first. A single specimen, female, from Fayetteville captured October fifth has green hind tibiae.

Melanoplus packardii Scudd.—I have collected this very variable species at three points in the State. It was found to be common on the shores of the Arkansas River opposite Pine Bluff on September first. I found it again amongst the rank vegetation about the mouth of the Big Buffalo in Marion County July twentieth. Specimens from these two localities differed strikingly in size and color and to a slight extent in structure. The former were smaller, paler, less distinctly marked and had green instead of purplish red hind tibiae. Still other specimens were captured

near Diamond Cave in Newton county July twenty-seventh which had either red or green hind tibiae and in other respects were intermediate between the first two series.

Melanoplus impudicus Scudd.—This species hitherto known only by three specimens from Georgia and Mississippi is represented by a considerable number of specimens in my collection. These seem to agree well with the published description and figure, excepting only that the tegmina never exceed the femora in the females and in the males there is no distinct post-apical tubercle on the subgenital segment and the apical half of the cerci is less than one half the width of the base. It is confined so far as I have observed to the open borders of woods on high land. From Madison, Boone, Carroll, Newton, Marion, and Washington counties.

Melanoplus gracilis Bruner.—This appears to be an uncommon species, though it is apt to be rather abundant where it occurs at all. I have met with it but twice; once near Yellville, Marion county where it was common on very dry rocky ledges amongst very sparse vegetation in company with *Hadrotettix* and *Trimerotropis*; again on the bank of White River a mile below Buffalo City, Marion county. Here it was quite common on the very rank vegetation which flourished in a soil which was occasionally enriched by the overflow of the river. Specimens from both localities agree well with specimens from Illinois and Indiana.

Melanoplus sylvaticus n. sp.—Medium size, brownish fuscous above, yellowish below; head testaceous, or brown much infuscated above and with a broad post-ocular stripe; occiput moderately tumid, slightly elevated above the pronotum; interspace between the eyes a little narrower (δ), or half as broad again (φ), as the first antennal joint; fastigium rather steeply delivent, deeply, (δ) or distinctly, (φ), sulcate; frontal costa slightly narrowed above, otherwise equal in width and nearly percurrent, distinctly sulcate (δ) at and below the ocellus, or slightly sulcate for a very short distance below the ocellus (φ) punctate throughout and about as broad as the inter-ocular space; eyes rather large, somewhat prominent, a little longer than the infra-ocular portion of the genae; antennae dark brown somewhat (δ), or scarcely, (φ), longer than the head and pronotum. Pronotum faintly (δ), or decidedly, (φ) expanding posteriorly; above infuscated (δ) or sometimes, (φ) ferruginous; on the sides flavous or flavo-testaceous below, with the upper portion occupied by a broad shining piceous stripe broadening slightly on the metazone; disk convex, passing by a slightly angulate shoulder into the anteriorly somewhat tumid lateral lobes; median carina distinct on the metazone, variable and more or less indistinct on the prozone but least apparent between the second and third sulci; front margin slightly convex or a little emarginate, hind margin very obtusely angulate; prozone decidedly (δ) or faintly (φ), longitudinal and about half as long again as the densely punctate metazone; prosternal spine conical, bluntly pointed; space between the mesosternal lobes as long as (δ), or not so long as (φ) broad. Tegmina slightly shorter than the pronotum, scarcely twice as long as broad elliptical, overlapping a very little, fuscous or brownish fuscous. Fore and middle femora slightly tumid in the male, green or flavous; hind femora rather slender but thick, flavous with the outer and inner faces

dark green or ferruginous, never in the least fasciate outwardly, sometimes with very faint infuscations on the upper surface and with a more or less deeply infuscated genicular spot; hind tibiae green with the extreme base more or less infuscated but without a pale ring basally; spines black, ten or eleven in the outer series. Extremity of abdomen in the male clavate scarcely at all recurved; the supra-anal plate triangular with the sides gently convex, the median sulcus very broad and deep, equal and terminated about the middle by a short transverse ridge; furcula very small, distant triangular denticulations; cerci shorter than the supra-anal plate, straight, rapidly tapering from the base to the middle, beyond very slightly tapering substyliform and bluntly pointed, the width at the middle being less than a third the width of the base; subgenital plate somewhat longer than broad, scarcely elevated apically and ending in a small tubercle.

Length of body, male, 17 mm. female, 25 mm.

Length of tegmina male, 4 mm. female 5½ mm.

Length of hind femora, male, 11 mm. female, 14 mm.

Seven males, three females, along wooded cliffs in Carroll, Boone, and Newton counties.

This seems to be an uncommon species though probably widely scattered. It is very closely related to *Melanoplus viridipes* Scudd., though it does not fall in the same part of Scudder's key owing to the differently shaped cerci. It is readily distinguished from that species by the straight, tapering, comparatively short cerci, the little recurved extremity of the male abdomen, the absence of post-femoral bands

so conspicuous in the allied species, the shorter tegmina and antennae and proportionally longer hind femora.

Melanoplus obovatipennis Blatchley.— A rather uncommon species. I have but eight specimens, four males and four females, found in Washington and Sebastian counties in September and October. Compared with Indiana specimens, the tegmina are more elongate, and the cerci shorter. This species is much more closely related to *Mel. gracilis* Bruner than would be indicated by their position in Scudder's key. This is the species I formerly mistook for *Mel. mancus* Smith which was erroneously reported by me to be found in Indiana.

Melanoplus baconi, n. sp.—Medium size, ferrugineo-fuscous frequently suffused with vinous red. Head moderately (δ) or not (φ) prominent; in front on the genae as well as on the lower part of the lateral lobes of the pronotum olivaceous flavous, more (φ), or less (δ) completely suffused with vinous red; vertex gently tumid and distinctly elevated above the pronotum; space between the eyes a little more than once (δ) or nearly twice (φ) as broad as the first antennal joint; fastigium considerably (δ) or slightly (φ), sulcate; frontal costa almost equal throughout, not quite reaching the clypeus, sulcate for a short (φ) or considerable (δ) distance below the ocellus, punctate; eyes only slightly longer than broad; antennae rufo-testaceous (δ) or red (φ) infuscated apically, a little (δ) or decidedly (φ) shorter than the hind femora. Pronotum feebly enlarging posteriorly in the female though the sides of the disk are parallel behind the first sulcus or even distinctly converging on the metazone, hardly expanding in the male even below; the sides

with a broad distinct piceous postocular stripe strictly limited to the prozone and generally contrasting strongly with the color below, about as distinct in the female as in the male; disk gently rounded passing into the lateral lobes by a very rounded shoulder (φ) or distinctly angulate (δ); median carina distinct and sharp, though slight, on the metazone; on the prozone slight and frequently wanting between the sulci, especially in the male; hind margin strongly but obtusely and roundly angulate; prozone scarcely longitudinal even in the male but little longer than the densely but shallowly punctate metazone; prosternal spine long, cylindrical, blunt, retrorse; space between the mesosternal lobes variable, one and a half times as long as broad (δ) or one and a half to twice as broad as long (φ). Tegmina abbreviate more than half the length of the abdomen, five sixths (female) the length of the posterior femora, costal and anal margins evenly and gently arcuate, apex blunt, the dorsal and lateral fields angularly separated, the former plain generally infuscated, the latter frequently with a median row of smaller spots. Fore and middle femora quite tumid in the males; hind femora testaceous, with the disk of the exterior face irregularly infuscated, rarely bifasciate with fuscous, the upper and inner faces plainly bifasciate, inferior face flavous, more or less suffused with red. The geniculation black or brown, hind tibiae red without black at the base and without sub-basal pallid annulus, spines black. Extremity of male abdomen moderately clavate considerably recurved; the supra-anal plate triangular, longer than broad with a very acute angulate apex and with gradually and considerably elevated sides and a broad median sulcus which is percurrent though narrowing apically and interrupted near the middle of the plate by a sharp and high transverse plication; furcula consisting of a pair of small widely separated diverging denticulations about as long as

the last dorsal segment, separated by a third of the width of the supra-anal plate and entirely outside of the sub-median ridges; cerci moderately broad and very heavy, their thickness equalling the middle width, gently tapering at the base, the apical two-thirds about equal and two-thirds the width of the base bent a little downward and scarcely perceptibly inward, the outer face sulcate apically, the extremity rounded above and angulate below, exceeding the supra-anal plate and falling short of the apex of the abdomen by a little more than their basal width, the length being three and a half times their width at the base. Subgenital plate about as long as broad, with the lateral margins sinuate and the apex much elevated.

Length of body, male, 22 mm.; female, 25 mm.

Length of tegmina, male, 10 mm.; female, 11 mm.

Length of posterior femora, male, 11 mm.; female, 12½ mm.

Three males, sixteen females all taken with the exception of a single female near the War Eagle ford between Spring Valley and Clifty in Carroll county, June twenty-sixth. The female referred to was taken a few days later near the same locality. All were captured in woods. This species falls in the *Texana* group of the genus near those species of the group that have the tegmina attingent and the subgenital plate of the male elevated apically but without a tubercle. It is readily separated from *Mel. lepidus* Scudd. by the red hind tibiae, the much longer overlapping tegmina, the larger size, lighter color, absence of fascia on the disk of the hind femora, and the longer and differently shaped cerci. It is readily

separated from *Mel. texanus* Scudd. by the unequal median carina of the pronotum, the nearly quadrate prozone of the male, the much longer tegmina and shorter hind femora, the widely separated and differently shaped furcula and the longer straighter and differently shaped cerci. Finally it is quite distinct from *Mel. blatchleyi* Scudd. in its shorter antennae and hind femora, in the quadrate prozone, the much longer tegmina, the absence of fascia on the disk of the hind femora, the absence of the fuscous base and pallid annulus of the hind tibiae, the much more distant furcula, the longer, heavier, straighter and differently shaped cerci, the longer supra-anal plate with its percurrent median sulcus. It is most nearly related in the structure of the pronotum, the furcula and the cerci to *Mel. lepidus* Scudd. from which it may not be distinct, but the obvious differences of tegmina and hind tibiae in addition to other points indicated in the description and the widely different habitat compel me to consider it specifically distinct. Named in honor of Mr. William Bacon to whose zeal as a collector I owe many of the Arkansas specimens in my collection.

Melanoplus scudderi Thos.—This is a common wood species in Arkansas in the extreme northwestern part of the State and in the east-central part. It does not occur in collections made in Boone, Carroll, Marion, Newton and Madison counties. The earliest date for its capture is September first and

the latest October twenty-eight. I think it survives the winter in the adult State as I feel confident I have seen on warm days in the middle of winter. Scudder's observations concerning the rounded tegmina of specimens from Texas applies equally well to the Arkansas form. There is also a marked variation in the length of the tegmina which are decidedly shorter or somewhat longer than the pronotum.

Nine males, twenty-two females.

Phoctaliotes nebrascensis Bruner. —

This species has not actually been

captured within the borders of the State but I have two males and one female which were taken a few miles within the Indian Territory and as the species occurs in Kansas and Texas and as far East as Indiana and Illinois, I have no hesitation in including it. The specimens referred to are much larger than those from Cordova, Illinois, and West Point, Nebraska, in my collection. The female measures 31 mm. the males 22 mm. and they are proportionately robust.

(End.)

CRYPTORHYNCHUS LAPATHI (L.) IN MASSACHUSETTS.

BY A. H. KIRKLAND, MALDEN, MASS.

A striking example of serious insect damage resulting from favorable local conditions is found in the occurrence of *Cryptorhynchus lapathi* (L.) in certain parts of Eastern Massachusetts. In Europe this beetle has gained much notoriety as a borer in alders and willows, but in Massachusetts its attack is largely directed against the balm of Gilead poplar. This leads us to a mention of a very interesting — from an entomological standpoint — state of affairs now existing in Winthrop, Revere and some other shore towns. The land being somewhat marshy and the balm of Gilead the indigenous tree that thrives best there, the streets and yards in the past have been largely planted with this tree. By far the majority of all

shade trees on this low land are of this species of poplar. The weevil gained a foothold here some time ago and having an apparent preference for this tree finds here nearly perfect conditions for multiplication and gives evidence of its intention to replenish at least this particular section of the earth. The branches or young stems, as the case may be, weakened by the boring of the larvae are easily broken down by ice storms or high gales. At the present time there is hardly a sound balm of Gilead in the localities mentioned and it would seem probable that this weevil in the future may become a considerable pest in places where this tree is largely grown. The weevil breeds in nearly all species of poplars and in willows. Mr.

John G. Jack, in *Garden and Forest*, vol. X., page 394, has given a most interesting account of damage by this insect to the willows in the Arnold Arboretum. The damage there by the beetle is not exceptional, for the writer has noticed similar injuries in many of the larger nurseries in Eastern Massachusetts. In fact, some of our nurserymen are contemplating abandoning entirely the cul-

ture of poplars and willows because of the damage caused by this insect. The matter of remedies being still under consideration the writer has recommended so far, in the case of infested shade trees, only the destruction of the trees in June and a replanting with the silver maple (*Acer dasycarpum*) or its variety, *Weirii*, either of which makes a good growth in damp localities.

A GENERIC TABLE OF THE FAMILY PANURGIDAE: A REPLY
TO MR. COCKERELL'S CRITIQUE ON THE SEGREGATION OF PERDITA COCKERELL.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

In *Psyche* for January 1899, Mr. Cockerell has made some criticisms on my segregation of the genus *Perdita* Cockerell, which seem to require a reply.

Now, I think the whole trouble with Mr. Cockerell is expressed in his opening sentence: "*I hardly know what to say about Mr. Ashmead's three new genera, established in Psyche pp. 284-285 at the expense of Perdita*"; and, had he waited a little longer and given himself more time to investigate the subject a little more thoroughly, I am convinced he would have been better able to have said something more to the point.

Perdita Smith, in my paper, is not defined, and the fact that Smith based his genus upon a specimen without maxillary and labial palpi has nothing to do with the validity of the genus *Cockerellia*.

The genus *Perdita* Smith, however, has been recognized, and while the labial palpi do not agree exactly with the imaginary figure of Smith's, there is still some resemblance, and the labial palpi are sufficiently different, according to my views, to readily distinguish it from *Cockerellia*; besides the other characters mentioned by Smith hold good, and these, as well as other differences between it and *Cockerellia*, will be brought out in my generic table given below.

Mr. Cockerell surely must be wrong when he says the male of *P. hyalina* or *albipennis* has the claws simple and the abdomen not banded! I have examined a great many *males* of this species and all have the claws cleft, and the abdomen banded. If Mr. Cockerell possesses a specimen without these

characters, it probably represents some other species in another genus.

I quite agree with all good systematists that color *alone* is not of generic value; but Mr. Cockerell, with others, must surely admit that it is of great value and assistance in recognizing certain genera when used with salient structural characters. The genus *Philoxanthus* was not based upon color alone as Mr. Cockerell intimates, and as he may readily see if he will again consult my description.

Mr. Cockerell seems loath to see *Perdita*, upon which he has done so much work, split up into subgenera, although inspired evidently by my beginning he does not hesitate to propose the generic name "*Perditella*" for what he calls "a really good subgenus" for his *Perdita larreae*, *marcialis* and *larrearum*. As so frequently occurs in Mr. Cockerell's work, as for instance in his subgeneric divisions of the Coccidae, he has not given a single essential character for the recognition of this genus. The only character given, namely, "second submarginal cell small, triangular" will not hold good for the three species mentioned, while the so-called large stigma is essentially the same as found in *Perdita* and *Cockerellia*, although it appears to Mr. Cockerell's eyes larger on account of the smallness of the marginal cell.

Perditella however, may possibly be retained for *larrea*, *marcialis*, and *luteola*. It is singular however, that all of the specimens of these species that I have

yet seen are males, and, I suspect, they may really represent the opposite sex of *Philoxanthus*. In the latter event the characters made use of in my table will then be of sexual and not generic value.

Mr. Cockerell sums up his remarks by saying: "I do not say that *Perdita* should not be divided into two or more genera; probably it will ultimately have to be split into half a dozen but it will be necessary to proceed with caution."

This is just about the number of genera I have recognized.

"Proceed with caution," is good advice, and it is a pity Mr. Cockerell has not followed it himself before erecting some of his recent new bee genera since most of them will be found to be synonyms. I find no less than four in the following group: *Hemihalictus* Ckll. equals *Dufourea* Lepeletier, *Hesperaspis* Ckll. equals *Rhophitoides* Schenck, *Callandrena* Ckll. equals *Biareolina* Dufour, while *Pseudopanurgus* Ckll. equals *Panurginus* Nylander.

In order to show how *Perdita* and allied genera are separated, I have concluded to publish my MS. generic table of the family Panurgidae, which is as follows:—

Table of Genera.

Marginal cell at apex more or less remote from the costa or obliquely, broadly truncate. 5
Marginal cell towards apex acuminate, attaining the costa.

- Abdomen usually rather long; second joint of hind tarsi normal, inserted in the middle of the first 2
- Abdomen subglobose, black, shining, with white fasciae at apex; second joint of hind tarsi angulate beneath, not inserted in the middle of the first; clypeus in ♂ yellow, the hind femora incrassated; antennae in both sexes filiform, longer than the head; tongue short. *Macropis* Panzer.
2. Body, and more particularly the thorax, distinctly pubescent, the abdomen with white fasciae 3
- Body sparsely pilose, the abdomen always glabrous, shining, not fasciate, although the anal segment is slightly ciliate at apex.
- Transverse median nervure interstitial, or very nearly; antennae in ♂ longer than the thorax, the joints of flagellum nodose beneath, appearing crenulate; hind tibiae with knee plate present in both sexes. *Halictooides* Nylander.
- Transverse median nervure not interstitial, joining the median vein *before* the basal nervure; antennae not longer than the thorax, the flagellum simple; maxillary palpi 6-jointed, the joints subequal; labial palpi 4-jointed, the first joint the longest, about as long as 2-3 united, the third longer than 2-4. *Dufourea* Lepeletier. (= *Hemihalictus* Ckll.)
3. Submedian cell usually shorter than the median or never longer, the transverse median nervure joining the median vein *before* the origin of the basal nervure, or interstitial with it 4
- Submedian cell a little longer than the median, the transverse median nervure joining median vein *beyond* the origin of the basal nervure.
- Thorax above with fulvous or ferruginous hairs; maxillary palpi 6-jointed; labial palpi 4-jointed. *Biareolina* Dufour. (= *Callandrena* Ckll.)
4. Thorax above usually with whitish or griseous pubescence, very rarely with a slight ochraceous tinge.
- Labial palpi deformed, the basal joint long and quite different from the last; face in ♀ with blackish hairs; antennae in ♂ longer than the thorax, the apical joints attenuated from the middle. *Rhophtes* Spinola.
- Labial palpi normal, all the joints being similar and nearly equal; face in ♀ with white hairs; antennae in ♂ as long as the thorax, the last joint acuminate at apex only *Rhophtoides* Schenck. (= *Hesperaspis* Ckll.)
5. Marginal cell at apex more or less acuminate or narrowly rounded, not or rarely truncate, although sometimes appendiculate; mandibles dentate 11
- Marginal cell at apex truncate; mandibles at apex acute or narrowly rounded, not dentate.
- Front wings with two recurrent nervures 6
- Front wings with only one recurrent nervure, the second obliterated (see below for characters of mouth parts) *Cockerellia* Ashmead (pars).
6. First submarginal cell much longer than the second; maxillary palpi 6-jointed 7
- First submarginal cell equal to or not much longer than the second.
- Maxillary palpi 4-jointed; abdomen black, smooth, shining, bare above, with the sides and fifth segment fimbriate with white hairs; labial palpi 4-jointed, the first joint almost as long as joints 2-4 united.
- Scapter* Lepel. (Type *S. brullei* Lepel.)
- Maxillary palpi 6-jointed; abdomen bare, with white bands; face and clypeus white or with a white spot; second submarginal cell receiving both recurrent nervures; submedian cell considerably shorter than the median *Camptopoeum* Spinola. (Type *C. frontale* Spinola.)
7. Species not almost entirely yellow 8
- Species yellow or almost entirely yellow; labial palpi very long, 4-jointed, the first joint fully twice as long as joints 2-4 united.
- Frontal foveae very distinct, long linear, black; clypeus semicircular at base; claws

simple; pygidial plate almost obtrapezoidal.

♀. *Philoxanthus* Ashm.

(Type *P. beatus* Ckll.)

Frontal foveae very small, represented by a rounded or oval black puncture; clypeus obtrapezoidal at base; claws cleft. ♂.

Perditella Cockerell.

(Type *P. larreae* Ckll.)

8. Abdomen aeneous, or rufous and black, ornate with red, yellow, or whitish maculae or bands; face usually yellow, or marked with yellow or white; stigma well developed recurrent nervures respectively interstitial with the first and second transverse cubiti, or both are received by the second submarginal cell 9

Abdomen black, rufous or yellowish, neither maculate nor banded; stigma either large well developed, or poorly developed, sublan- ceolate; both recurrent nervures received by the second submarginal cell or the first is interstitial with the first transverse cubi- tus. 10

9. Marginal cell not short, much longer than the stigma, fully twice as long, and as long or longer than the first discoidal cell; sub- median cell a little shorter than the median; labial palpi 4-jointed, the first joint very long, 7 or 8 times longer than joints 2-4 united, contracted at base.

Nomadopsis Ashmead.

(Type *C. zonalis* Cr.)

Marginal cell very short, shorter than the stigma or no longer, and always very much shorter than the first discoidal cell; labial palpi 4-jointed, the first joint very long and usually somewhat thickened, fully twice as long or even more than twice as long as joints 2-4 united; hind tibial spurs finely serrated; claws at least in ♂ cleft.

Cockerellia Ashmead.

(Type *P. hyalina* Cr. *albipennis* Cr.)

10. Marginal cell short not longer than the stigma, usually a little shorter, the stigma large, broad well developed; head seen from in front usually longer than wide; clypeus somewhat produced anteriorly, truncate, the

labrum distinct, transverse; labial palpi 4- jointed, the first joint the longest but rarely longer or much longer than joints 2-4 united; claws cleft; hind tibial spurs simple.

Perdita Smith.

Marginal cell long, always much longer than the stigma; stigma rather small, or narrow, lanceolate; head large, seen from in front usually much wider than long; labial palpi 4-jointed the first joint very much longer than joints 2-4 united; claws cleft; hind tibial spurs finely serrated; antennae short, scarcely as long as the width of the head. *Macrotera* Smith.

Stigma broad, oblong-oval or at least not lanceolate; head normal, as seen from in front rounded, not wider than long; antennae longer than the width of the head.

First submarginal cell, along the cubitus, not greatly longer than the second.

Hind tibiae and tarsi in ♀ with a long dense pubescence; clypeus in ♂ black, with long hairs; eyes black; labial palpi 4-jointed, the first joint very long, usually longer than 2-4 united.

Panurgus Latreille.

Hind tibiae and tarsi in ♀ with short, rather sparse pubescence; clypeus in ♂ usually yellow or marked with yellow, hardly pubescent; legs black varied with yellow; labial palpi 4-jointed, the first joint about as long as joints 2-4 united.

Panurginus Nylander = *Parandrena* Robt. = *Pseudopanurgus* Ckll.

First submarginal cell, along the cubitus, about twice or nearly, as long as the second; each submarginal cell receiving a recurrent nervure; transverse median nerve joining the median view much before the origin of the basal.

Scapteroides Gribodo.

11. Submarginal cells very unequal, the first about thrice as long as the second, the latter quadrate or nearly; the first recurrent nerve is received by the first submarginal cell

near its apex, the second, by the second submarginal cell near apex; submarginal cell much shorter than the median; head seen from in front oblong, about twice as long as wide, the eyes fully thrice as long as wide; antennae clavate; mandibles bidentate at apex; maxillary palpi 6-jointed; labial palpi 4-jointed, the first joint the longest.

Hylcosoma Ashm.

Submarginal cells along the cubitus, unequal, the first the longer, the second narrowed one third above; transverse median nervure interstitial; head normal; maxillary palpi 6-jointed; labial palpi 4-jointed, subequal, the joints enlarged at apex; thorax above clothed with a dense pubescence; flocculus on hind tibiae and tarsi long, dense.

Dasy-poda Latreille.

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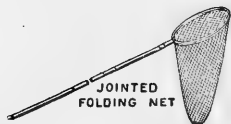
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PSYCHE.

MOSQUITOES CONSIDERED AS TRANSMITTERS OF YELLOW FEVER AND MALARIA.

BY CHARLES J. FINLAY, M.D., HAVANA.

(From the N. Y. Medical Record of May 27, 1899.)

THE despised mosquito, denounced by me since 1881 as the agent of transmission of yellow fever, is now attracting considerable attention among distinguished and sagacious observers who attribute to that insect an important rôle in the etiology and propagation of the malaria infection. To those who are familiar with the biological conditions and the habits of the mosquito, this will not be a matter for surprise; rather should we wonder how, considering the special aptitudes of the insect, other inculcable diseases are not equally transmitted by it, especially such as are due to germs in the blood or in the tissues that lie within reach of its sting. Much light, however, has been thrown upon this singular eclecticism by modern ideas concerning the process by which some blood-sucking insects convey certain diseases to warm-blooded animals. We are induced by them to regard as one of the essential conditions that the transmitting insect should itself experience a true infection, which may not endanger its life nor greatly disturb its physiological functions, but must always

require, on the part of the insect, pathogenous susceptibility for the specific germs which it is called upon to transmit. It will thus be readily understood why the same insect may transmit only certain germs and not others, as also that, among insects of the same kind, some species may possess that faculty while others do not.

Among the publications that have appeared concerning the transmission of malaria by mosquitoës, the most important one, and that which has caused most sensation, has been the lecture delivered, a few months ago, by Robert Koch, in which he declares himself decidedly in favor of the mosquito theory as the one which most plausibly accounts for the propagation of the said disease. In support of his idea he cites a very appropriate precedent, the Texas fever, a cattle disease, the etiology and propagation of which were so ably cleared up in 1892 by Dr. Theobald Smith, chief of the division of animal pathology in the Bureau of Animal Industry, United States of America. Dr. Smith proved that the germ of the

disease is a blood-parasite, and that it is propagated by the cattle tick. The germs sucked in with the blood of diseased cattle reach the eggs of the tick, and the new generation of ticks, developed from the infected eggs, convey the Texas fever to the sound cattle upon which they are applied. His experiments were repeated and confirmed in Eastern Africa by Koch, who in view of the relations which seem to connect the presence of mosquitoes with the transmissibility of malaria, does not hesitate to make those insects responsible for the propagation of the malaria infection. He does not think, however, that the latter can be communicated by so simple a process as that of a mosquito first stinging a malaria patient and afterward a sound person, such as I have, in my theory, considered capable of causing the transmission of yellow fever. The grounds for this distinction, however, are not very apparent. In the case of the tick, which is supposed not to attack a second animal after parting from its first host, the exclusive transmission by the second generation, infected through the eggs, may be considered a necessity; but it is otherwise with mosquitoes, at any rate with those which I have observed in Havana. After an interval of two or more days, which they require to digest the blood and empty themselves, they are ready to sting the next victim that offers, and may do so as many as ten or twelve times, during the thirty or more days that I have been able to keep them alive. It is, therefore, quite

admissible that, when the mosquito becomes contaminated, not only its eggs but also its salivary and venom glands may be invaded by the pathogenous germs, so that the latter may be discharged with the secretion of those glands along the track of the wound and into the capillary vessel entered by the sting when the insect attacks its next victim. Indeed, on some rare occasions I have seen mosquitoes die within twenty-four hours after they had stung a patient with severe yellow fever, without assignable cause, for they still retained some of the blood which they had sucked; whence it might be surmised that the yellow-fever germ is pathogenic for the Havana mosquitoes, though the infection seldom proves fatal for those insects.

In August last, during my stay in the field hospitals on the hills near Santiago, I witnessed a fact which, as far as it went, agreed with my theory about yellow fever, inasmuch as there were neither mosquitoes, mosquito eggs, nor larvae to be found in my encampments, and not a single case of yellow fever occurred among the one hundred and fifty men who came under my observation, notwithstanding the daily communications with the city. It was otherwise, however in regard to malaria, for this constituted the prevalent cause of sickness in all those camps. It assumed various types: the quotidian or tertian intermittent, the remittent, irregular, or subcontinuous; but in most of the cases it was accompanied by diarrhoea (sometimes mixed with

blood). This instance, at any rate, shows that Koch's assertion, that "where there are no mosquitoes there is no malaria," is altogether too absolute. In those camps, I believe the propagation must have been effected through the flies (of which there was a great abundance). These insects, in spite of all precautions, had ample opportunities of picking up, from the discharges of the malaria patients, not only the malaria parasites contained in the extravasated blood, but also some infectious intestinal germ, with both of which organisms they may have contaminated the food and beverages used by the men who subsequently showed signs of the double infection. A yellow-fever epidemic occurring under similar circumstances, in the absence of yellow-fever mosquitoes, might not be so readily reconciled with my theory about that disease, which is founded upon more definite and more exclusive arguments than those recorded in connection with the malaria infection. The following instance may serve to illustrate my meaning. In the capital of Mexico, and in other districts of similar altitude above the sea level, Mexicans who never have visited the lowlands have no immunity whatsoever against yellow fever, a sure proof that no epidemics of that disease ever occur in that part of the country. It sometimes happen, however, that a resident of the capital takes the infection by going to Vera Cruz, though the disease may not declare itself until his return to the capital. In such cases,

the yellow fever will run its usual course, with the same symptoms and prognosis as if the patient had remained at Vera Cruz; with this difference only: that in Vera Cruz other susceptible persons might readily have caught the infection from him, whereas in Mexico the disease is never propagated. If the infection could be transmitted through contact with the patient or his secretions, by inhaling his emanations in the sick room, or by the use of contaminated food or beverages, there would be no imaginable reason why the disease should not be transmitted at Mexico as well as at Vera Cruz. Such not being the case, we must infer: first, that a factor which is necessary for the transmission is present at Vera Cruz, but is absent from Mexico; and second, from the circumstance of the disease not being transmissible through the forms of exposure enumerated above, that the yellow-fever germ is pathogenous only when introduced in a less trivial manner, probably by inoculation under the epidermis or even directly into a blood-vessel. Hence my theory of the mosquito.

New Mosquito Theory.—My original mosquito theory, however, in view of the facts brought to light by Dr. T. H. Smith, in his admirable demonstration of the transmission of the Texas fever through the agency of the cattle tick, requires now to be somewhat modified, so as to include the important circumstance that the faculty of transmitting the yellow-fevergerm need not be limited to the parent insect, directly

contaminated by stinging a yellow-fever patient (or perhaps by contact with or feeding from his discharges), but may be likewise inherited by the next generation of mosquitoes issued from the contaminated parent. With this new development, indeed, the theory seems to cover the whole ground of conditions which are known to govern the transmission or non-transmission of the disease, and to account for every well authenticated fact on record.

There are different species of mosquitoes which are peculiar to certain localities, even within the yellow-fever zone, though we are not able to account for their preferences in this respect, nor for the circumstances which determine their permanency in such limited areas. It is a fact, however, that the "domestic mosquito" (by which term I mean such species as constitute a parasite and commensal of man) shows no inclination whatever for extensive excursion so long as the female insects find at hand convenient subjects from whom they can draw the warm life-blood which they apparently require, not so much for their own nourishment as for the purposes of ovulation and for the reproduction of their species. That the tropical species cannot well establish themselves in temperate or cold climates, will be readily understood by repeating the following experiments: Let a mosquito of the small diurnal species found in Havana be introduced into a test tube provided with a thermometer; if the temperature be lowered, it will be seen that, when it falls

to between 15° and 19° C. (59° and 66.2° F.), the insect becomes benumbed, and unless it finds some object upon which it can fasten its claws it will drop to the bottom of the tube, in a condition of apparent death, in which it will remain so long as the temperature is kept between 15° and 0° C. (59° and 32° F.). On allowing the temperature to rise again, when it reaches above 15° to 19° C. the mosquito will gradually revive and soon recovers its normal agility and the power of stinging. On the other hand, if the mosquito is confined in a closed tube and the air gradually rarefied, the insect appears to lose the power of supporting itself on its wings, and also that of stifflening its proboscis for the purpose of stinging. With temperatures below 25° C. (77° F.), the time required by the culex mosquito to digest the blood and get ready for another bite is prolonged to several days; and, according to my observations, the pupae of that species, if kept at temperatures below 23° C. give five males to one female, whereas at 25° - 30° C. the proportions are reversed. Hence it follows that during the cold season in Havana there are comparatively few mosquitoes of that kind in a condition to propagate the yellow fever. At sea mosquitoes will save themselves from being blown into the water only by avoiding the deck and other exposed parts of a vessel, and in travelling toward cooler regions they will have an additional motive for seeking refuge in the warmer and more sheltered parts of the ship. Hence the likelihood of

their gathering in the holds of vessels, in which the source of yellow-fever infections has been, many a time, distinctly located. Once boxed up inside the hold of a vessel, the contaminated mosquito may be reduced to the necessity of drawing its blood supply (*faute de mieux*) from lower animals, such as rats, etc., and to lay its eggs in any collection of fresh water that may have found its way through the chinks or otherwise. On land, mosquitoes will instinctively frequent the basement or ground floor of houses in preference to the upper ones, and they seldom seek the open air of their own accord, while their usual functions can be fulfilled under shelter, except when they are ready to lay their eggs. This is in accordance with the maternal instinct which teaches them to procure undisturbed possession of some stagnant waters for their larvae during the two or more weeks required for the complete development of the winged insect; a condition seldom satisfied within inhabited dwellings. On the approach of its natural death, the parent insect returns to the same waters where its eggs have been laid, and its cadaver remains floating on the water, to be devoured by its own larvae. Entrapped during the unconscious act of a person putting on his hat in a contaminated locality, mosquitoes may be conveyed to distant houses; and inside of boxes, trunks, parcels, etc., provided that a sufficient degree of moisture and particles of available food exist in their place of confinement, they can be

conveyed to any distance that may be reached within the natural term of the insect's life (which sometimes lasts as many as thirty or thirty-five days).

My experiments upon yellow-fever mosquitoes have already been published; their results may be thus briefly recorded: first, Reproduction of the disease, in a mild form, within five to twenty-five days after having applied contaminated mosquitoes to susceptible subjects; second, partial or complete immunity against yellow fever, obtained even when no pathogenous manifestation had followed those inoculations; third, finally, the coincidence of cultures made with the heads and proboscides of contaminated mosquitoes giving the identical micrococcus in tetrads (*M. tetragenus febris flavae*; *M. tetragenus versatilis*, Sternberg; *tetracoccus versatilis*) previously discovered by me, in collaboration with Dr. C. Delgado, in the blood and secretions of yellow-fever patients.

With such an array of evidence (presumptive or otherwise) as to the rôle of the mosquito in the propagation of yellow fever, and the concurrence of Koch, Manson, and other experts of the highest order in their advocacy of a similar doctrine for the transmission of malaria, the time seems at last come when decided measures of protection against mosquitoes should be seriously considered; the more so as the energetic spirit of the Anglo-Saxon race is about to replace the fatalistic apathy of former rulers in Cuba and Porto Rico. The suggestion of Koch, calling for

dwelling from which mosquitoes could be barred out, in order that the German colonies of Eastern Africa might be freed from malaria, ought surely to be acted upon in countries where it is not only malaria that has to be contended with, but also the dreadful yellow fever, aptly called the "plague" in the early Spanish chronicles of America, from its analogies with the Oriental disease of that name. Why should not the houses, in yellow-fever countries, be provided with mosquito blinds, such as are used in the United States as a mere matter of comfort, whereas here it might be a question of life or death? The mosquito larvae might be destroyed in swamps, pools, privies, sinks, street-sewers, and other stagnant waters, where they are bred, by a methodical use of permanganate of potassium or other such substances, in order to lessen the abundance of mosquitoes; but the most essential point must be to prevent those insects from reaching yellow-fever patients, and to secure a proper disinfection of all suspicious discharges, in order to forestall the contamination of those insects. Well ventilated hospitals should be built on high grounds, with

no stagnant waters or marshes in their vicinity, the doors and windows protected by mosquito blinds, a good system of drainage and sewerage, with facilities for disinfecting all suspicious discharges, and for destroying such mosquitoes and larvae as might be found within the building. Only the upper stories should be occupied by the sick, and none but yellow-fever patients, and such malaria patients as are immune against yellow-fever, should be admitted. The examination for admission might be carried out in a separate building, and a separate department devoted to suspicious cases under observation.

With such hospitals at hand, and an efficient board of health that would see to the proper arrangements for patients who could be left in their homes, and general sanitary improvements in and around the principal cities, there can be little doubt that yellow fever might be stamped out of Cuba and Porto Rico, and malaria reduced to a minimum. It would then be the business of the port and quarantine officers to prevent the introduction of fresh germs.

THE COMMOTION IN KANSAS AND MISSOURI UPON THE APPEARANCE OF DISSOSTEIRA IN COLORADO.

BY S. J. HUNTER, LAWRENCE, KANSAS.

In looking over the literature upon *Dissosteira longipennis* Thos., I was surprised to find that no detailed record

had been made, in literature readily accessible to entomologists, of the grave fears in Kansas and Missouri caused by

this locust's invasion of Colorado in 1891. It is not overstating the matter to say that it was rumored and credence given the report that the migratory locust was approaching from the west, and that the effect of such a rumor was little short of a panic. The large full-faced headlines of some of the leading dailies of Kansas and Missouri published at that time illustrate the feeling. A few are here shown:—

"Not Red Legs. No Grasshopper Plague. Professor Snow Says The Insects On The Colorado Border Are There All The Time. He Says They Are Of The Long Winged Variety. There Is No Danger Whatever From The Pest Either This Year Or Next." (Headlines from Kansas City Journal of July 14, 1891.)—No Need For Fear. Colorado's Visitors Harmless. Chancellor Snow Reassures The Farmers Of Kansas. The Present Grasshoppers Not The Terrors Of The Past. No Attacks Being Made By The Insects Upon The Corn."

Under this latter heading appeared the following telegram from Professor Snow:—

"Arriba, Col. (seventy miles from the Kansas line), July 16—My observations have confirmed my previous opinion that the grasshoppers now infesting portions of eastern Colorado will not invade Kansas.

It is not the destructive Rocky Mountain locust which devoured Kansas in 1874 and 1875, but a native species of the plains—the long winged locust.

This species is now devouring the forage grasses of this vicinity, but leaves entirely unharmed the numerous corn fields in the infested area. One or two good rains will repair the damage done to the range." (From the Kansas City Times of July 16, 1891.)

"Safe! Report Of The 'Capital's' Special Commission Investigating The Locust Pest. Careful Observations Develop The Fact That The Kansas Farmer Is Safe From The Robbing Horde. An Undesirable Journey. Seventy-five Miles Of Wagoning And Fighting With The Advance Guard. Scientific Conclusions, Deduced From Actual Observation Of The Habits And Movements Of The Scourge. A Southward Movement Indicated By The Latest Tactics Of The Invaders. The Investigation Completed." (Headlines from Topeka Capital of July 17, 1891.)

Chancellor F. H. Snow and Professor E. A. Popenoe were commissioned by the "Topeka Capital" to investigate the actual conditions. They accordingly went to the infested region, and gave the subject careful consideration. Their report, made after traveling by wagon over the territory attacked, contains many interesting features. The infested district covered an irregular tract of about 300 square miles in the northern part of Lincoln County, Colorado. The approximate boundaries were from Limon, sixteen miles east, nine miles south, seven miles west diagonally southeast fifteen miles to Hugo. And it is interesting to quote the language of the report.

"Within this area the two favorite grasses of the range, buffalo and grama grass, have been eaten to the ground. Even here, however, other vegetation is untouched, not excepting the fields of young corn in luxuriant growth."

"The only injury to any field crop which has come to our knowledge, is the destruction of a twelve acre field of fodder sugar cane or sorghum, only four inches in height. We have repeatedly seen the locusts passing

through the cornfields in swarms without inflicting the slightest injury."

"When the devouring multitudes are at work upon the grass the noise of the grinding of their jaws is distinctly audible to the listener as a well defined crackling sound.

"Over the face of the country traversed by the hosts, their almost complete destruction of the grasses leaves the ground looking bare and brown, while ahead of them the hills are fresh and green. The coarser grasses in the "draws" are generally left untouched, as are also the numerous asters, sunflowers, goldenrods, and many other plants."

"As we left Hugo this afternoon on our way northeast to Arriba, thousands of these heavy flyers came dashing into our faces. Our horses were greatly annoyed, and it became necessary to protect our eyes from the force of the blows inflicted by the numerous collisions.

The average rate of travel for the individual was about a mile in six hours;

this rate was not maintained through the day. They were most active during the middle of the day and advanced north at the rate of nine miles in two weeks and south at about the same rate. The eggs from which these hordes came were deposited the previous August and September by locusts which flew into this area. No internal parasites were observed. A species of *Asilidae* was noted capturing and killing several individuals.

These notes are of interest in throwing light upon the habits and destructive possibilities of a species of locust up to this time comparatively rare, and therefore considered of little economic importance. The causes which give rise to the sudden appearance in great numbers of a species, classed as rare, are not readily found. They are, nevertheless, an interesting study.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—II.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Nemoria subcroceata Walk. The specimens from which eggs were obtained were in poor condition, but Dr. Hulst remarks, "I took this to be a faded specimen of *Nemoria subcroceata*" and I believe that this determination is correct. I find no previous description of the larva.

Egg. Elliptical, flattened above and below, pale green, slightly shining; surface smooth, finely shagreened; size $.6 \times .5 \times .3$ mm. Later the color is greenish yellow.

Stage I. Short, with normal feet, the thorax contracted. Head round, pale brown,

width .25 mm. Body pale brown, a broad dorsal and fainter narrow subdorsal light red lines; cervical shield and anal plate not differentiated. Feet a little paler than the body, moderate except the anal pair which are large and widely spread laterally. Setae *i* to *v* small, black, with large clubbed tips, the tubercles minute; head setae also clubbed; cervical shield area roughened, the tubercles there slightly produced. Later pale ochreous greenish with faint whitish subdorsal and lateral lines. Skin finely reticular shagreened. Still later rusty brown

dorsal, subdorsal (below the white one) and subventral bands appear.

Stage II. Head with conical pointed lobes; four conical points on the cervical shield, the posterior pair small, anal flap triangular and with the anal feet large. Dark brown, paler subventrally, on the anal plate and feet; densely white frosted with numerous granules which segregate to form a linear pale subdorsal line. Width of head about .4 mm. The larva is a slender normal Geometrid.

Stage III. Lobes of head conical, high and pointed, the vertex therefore deeply notched; width .6 mm. A pair of similar conical points on the cervical shield anteriorly. Anal plate pointed behind. Otherwise the larva is smooth, slender, of a pale dead-leaf brown, frosted with whitish granules that form narrow, obscure, subdorsal, lateral and subventral lines and oblique ones between the subdorsal and lateral. Setae obsolete except on joint 13.

Stage IV. Head high with pointed flat lobes, greenish brown, brown on the angles and narrowly in two lines that form an X-mark with the clypeal sutures; width .8 mm.

The points on the cervical shield are not so high as the lobes and are roughened; anal plate with a pointed projection; anal foot-plate large. Body slender, smooth, greenish brown, thickly white granular, forming faintly raised pale lines one granule wide; a dorsal, subdorsal, wavy lateral (almost forming a series of obliques) and subventral, all obscure. A series of dorsal, intersegmental, deep brown dashes on joints 5 to 9.

Stage V. Head roughly granular, 1.5 mm. wide, marked as before, but there is a whitish shade on the front of each lobe. Cervical horns red tipped. Otherwise as before. Towards the end of the stage the larvae became shrunken so that the dorsal brown spots were occluded in the incisures; they looked shorter and thicker and more densely granular. They sit erect without spinning a supporting thread.

The species is single brooded. Eggs laid June 14th from moths that were at the end of their time of flight. The larvae spun August 4th and pupated on the 7th, passing the winter in this state. The larvae fed on the red oak (*Quercus coccinea*). Found at Brookhaven, Long Island, N. Y.

DESCRIPTION OF THE TYPE OF POLYDONTOSCELIS ASHM.

BY WILLIAM H. ASHMEAD, WASHINGTON, D. C.

In my generic tables of some Homoptera, published in *Entomologia Americana*, vol. V, p. 126, I characterized a new genus under the name of *Polydontoscelis*, the type of which has never been described. This I propose to do now since the type is requested of me for study.

Polydontoscelis differs from *Aethalion* Latreille, principally by having no cross-veins on the clavus, the cross-veins in the costal cell being more numerous, the submedian cell having only one cross-vein, while all

the tibiae have a broad rather deep, longitudinal channel outwardly, the hind and lower edge of the posterior tibiae being armed with numerous minute teeth.

Polydontoscelis cintifrons n. sp.—♂.—Length to tip of tegmina 9.5 mm; breadth across shoulders 3.6 mm. Brownish-yellow with a greenish tinge, and probably greenish-yellow in life. Head seen from in front with two transverse bands; pleura with a longitudinal black band, extending forward and connected with a similar band on the

cheeks. Thorax above punctate, with a median carina which is connected anteriorly with much abbreviated lateral carinae that converge toward the tegulae but which do not quite attain to the middle of the mesonotum; on each side of the middle carina is a blackish or dusky streak; the depressions on the outer side of the lateral carinae are also blackish, while there is also an oblique, dusky band just beyond and interstitial with them; scutellum with a triangular black spot at base; most of the cross-veins in the tegmina are black or piceous-black, while the longitudinal veins are interrupted with black marks. Legs and especially the femora sprinkled with black dots; anterior tibiae with the apical two-thirds of the channel and a spot near base, base of second tarsal joint and the last tarsal joint above black; middle tibiae with a spot in channel at base, another at apex and at middle beneath black; hind tibiae with a narrow annulus at base, another at the middle and the apex black. Abdomen immaculate; terminal ventral segment much longer than wide, at apex truncate; genital valves triangular, the plates lanceolate curving upwards.

Hab.—St. Nicholas, Florida.

Described from a single specimen taken on gall-berry bushes (*Ilex glabra*), by sweeping.

PROCEEDINGS OF THE CLUB.

14th April, 1899. The 20th meeting was held at 156 Brattle Street, Mr. J. W. Folsom in the chair.

The annual report of the treasurer was read and accepted.

Mr. S. H. Scudder read an article by Mr.

A. H. Kirkland on the abundance of *Cryptorhynchus lapathi* along portions of the seacoast of Massachusetts, and the injuries caused by this weevil, especially to the balm of Gilead poplar.

Mr. J. W. Folsom said that he had found it quite abundant in Cambridge, where it has often caused much damage to willows.

Mr. C. C. Adams showed specimens of the larva of *Oestrus ovis* taken from the skull of a sheep.

Mr. W. L. W. Field stated that he had recently been studying historically the cases of the occurrence of southern butterflies in New England, which he believed were due less to the fact that the species were actually extending their range of distribution northward than to the increase of collectors; this would account for the fact that such instances are more frequently noted in recent years.

He also spoke of the abundance in late years in southern New Hampshire of *Clisiocampa distria*, a species injurious to the sugar maple; and said that he had found living caterpillars of *Pieris rapae* in cabbages in January, some of which had apparently been feeding recently.

Mr. S. H. Scudder exhibited Charpentier's figure of *Eurycnema herculanea*, a Phasmid recently found to be parthenogenetic, von Brunn stating that a German merchant in Batavia had reared three successive generations from isolated females, all the progeny also being female, with the possible exception of a single malformed individual which died young.

Mr. J. W. Folsom showed specimens of *Periplaneta americana* received at Trenton, N. J., in bales of cocoa fibre from Manila.

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Samuel H. Scudder. I

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The regular meetings of the Club are now held at 7.45 P.M. on the second Friday of each month, at No. 156 Brattle St. Entomologists temporarily in Boston or Cambridge or passing through either city on that day are invited to be present.

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PSYCHE.

THE SEGMENTATION OF THE INSECT HEAD.

BY JUSTUS WATSON FOLSOM, CAMBRIDGE, MASS.

The elucidation of the primitive segments in arthropods is a most interesting and difficult morphological problem. The rule of Savigny — emphasized by Huxley and others — that arthropods are fundamentally constructed of successive rings, each of which may bear but one pair of primary appendages, although now undoubted, has never been thoroughly substantiated when applied to the hexapod head. After years of argument, morphologists still disagree as to the number of somites composing the highly differentiated heads of insects. Compare the latest text-books in respect to the subject. Kolbe ('90) recognizes five, as follows :

1. Ursegment: Fühler, Augen, Oberlippe.
2. " Oberkiefer oder Mandibeln.
3. " Unterkiefer oder Maxillen.
- [4. " Zunge oder Innenlippe.]
5. " Unterlippe.

Sharp ('95) says, "Morphologists are not yet agreed as to their number, some thinking this is three while others place it as high as seven; three or four being, perhaps, the figures at present most in favour, though Viallanes, who has recently discussed the subject, considers six, the number suggested by

Huxley, as the most probable. Chodkovsky is of a similar opinion."

Packard ('98) gives six :

<i>Segment.</i>	<i>Appendages, etc.</i>
1. Ocellar (Protocerebral).	Compound and simple eyes.
2. Antennal (Deutocerebral).	Antennae.
3. Premandibular, or intercalary (Tritocerebral).	Premandibular appendages.
4. Mandibular.	Mandibles.
5. First Maxillary.	First Maxillae.
6. Second Maxillary.	Second Maxillae, or Labium. Post-gula, gula, submentum, hypopharynx, (lingua, ligula), paraglossae, spinneret.

Upon anatomical grounds, different observers have recognized from one to seven head segments. As mentioned by Packard ('98), Burmeister found only two; Carus and Audouin three; MacLeay and Newman four; Straus-Durckheim seven. Huxley ('77) said, "It is hardly open to doubt that the mandibles, the maxillae, and the labium, answer to the mandibles and the two pairs of maxillae of the crustacean mouth. In this case, one pair of antennary organs found in the latter is wanting in insects, as in other air-breathing arthropods, and the existence of the corresponding somite cannot be proved. But if it be supposed to be present, though without any appendage, and if the eyes be taken to represent

the appendages of another somite, the insect-head will contain six somites."

Huxley's conclusions were the most satisfactory that could be derived from a study of the completed organs alone and reduced the problem to these questions: Do the eyes represent a somite? Is another antennal segment represented in insects? Do the labrum and hypopharynx represent distinct segments?

Authors began to realize the impossibility of settling the problem upon purely anatomical data and attacked it from the embryological side. Packard ('71), followed by Graber ('79), found four cephalic somites: antennal, mandibular, first and second maxillary. Viallanes ('87), however, wrote the most important contribution upon the subject after studying the development of the nervous system in insects and decapod crustacea, and summarized his results as follows.

"La tête de l'Insecte est formée par six zoonites, trois sont prébuccaux et trois post-buccaux. Le premier zoonite porte les yeux composés et les ocelles. Le deuxième les antennes. Le troisième, qui est dépourvu d'appendices, porte le labre, pièce qui, pas plus chez les Insectes que chez les crustacés, ne peut être considérée comme le résultat de la soudure de deux appendices. Le quatrième zoonite porte les mandibules, le cinquième les mâchoires, le sixième la lèvre inférieure." These conclusions have been confirmed by Wheeler ('93), Heymons ('95, '97) and others.

Rudimentary intercalary, or premandibular, appendages have been found

in Anurida (Wheeler '93, Claypole '98) and Campodea (Uzel '97), and the last two authors have homologized them with the crustacean second antennae. I may add that rudimentary chitinized intercalary appendages persist in adults of Tomocerus, Orchesella and other Collembola.

Six cephalic somites are the most that have been admitted upon embryological grounds—but I am convinced that six are not adequate. To prove this statement, I must give a preliminary summary of some recent studies upon the anatomy and development of apterygote mouth-parts.

The hypopharynx in Collembola and Thysanura consists of three parts: a median ventral lingua and two dorso-lateral *superlinguae*, hitherto termed "paraglossae," but quite distinct from the labial structures with the same name. In the embryo of Anurida maritima, the superlinguae originate as a pair of simple papillae between the mandibles and first maxillae and slightly nearer the median plane. The superlingual anlagen are ectodermal evaginations containing intrusive mesoderm and are histologically undistinguishable from the anlagen of the remaining appendages. The lingua appears as a subsequent and quite independent median evagination of the first maxillary segment and becomes supported by a pair of lateral chitinous stalks which originate in superficial grooves of the germ band.

Soon after involution has occurred, just seven pairs of cephalic ganglia are

seen and — important facts — the third pair belongs to the intercalary segment and the fifth to the superlingual somite. The lingua has no ganglia. Later, the first three pairs unite to form the supra- and the remaining four, the suboesophageal ganglion.

More conclusive proof that the intercalary and superlingual appendages represent primitive segments, of which there are seven, could hardly be expected.

In Campodea (Uzel '98) and Ephemera (Heymons '96) the hypopharynx originates as three independent anlagen and several authors have held it to represent a somite upon anatomical grounds. The hypopharynx of highly specialized insects, however, I find to be homologous with simply the *lingua* of Collembola and Thysanura, although the superlinguae are represented in the more generalized Pterygota but have usually been overlooked or disregarded.

Among Apterygota the lingua and superlinguae do not unite, although their three cavities become basally confluent with the general body cavity. In Orthoptera and Ephemera, however, the superlinguae are firmly united with the lingua. Although often conspicuous in the latter group (Vayssière '82), the superlinguae are less so in Orthoptera but I have found them as distinct lobes in all families of the order. The chitinous lingual stalks, important in Collembola and Campodea, become reduced and functionless in Machilis and Lepisma but occur as rudiments even in Orthoptera,

including Hemimerus (Hansen '94). Miall and Denny ('86) have figured them for Periplaneta and I have found them clearly in Melanoplus femoratus.

There are striking and detailed agreements between the anterior somites of insects and decapod crustacea. Viallanes ('87) and Hansen ('93) have emphasized the fact from their respective standpoints of embryology and comparative anatomy. My own results, confirming and supplementing their views, may partially be expressed in tabular form. Between such divergent groups, of course, homologies indicate nothing more than a parallelism in development.

EQUIVALENT PAIRED ORGANS.

Somite	Hexapoda	Crustacea
1	Compound eyes	Compound eyes
2	Antennae	Antennules
3	Intercalary appendages	Antennae
4	Mandibles	Mandibles
5	Superlinguae	First Maxillae
6	First Maxillae	Second Maxillae
7	Labium	First Maxillipedes

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DESCRIPTIONS OF THREE NEW SPECIES OF ALEURODIDAE FROM BRAZIL.

BY ADOLPH HEMPEL, S. PAULO, BRAZIL.

Aleurodes horridus n. sp.—*Pupa-case*.—Length, 1 mm.; elliptical in outline, flat; light yellow in color. The dorsal surface is covered with white secretion, arranged in a median longitudinal row, and a submarginal row on each side. Around the margin there is also a very short fringe of white wax. These details are however obscured by a mass of long yellowish, hair-like secretion, that envelopes each individual. Denuded of wax, the margin is found to be doubly crenulated, with the posterior end of the body rounded and the anterior end forming an obtuse angle. The dorsum is slightly wrinkled, and has a short median longitudinal ridge, extending from the anterior end to nearly the middle of the body.

Vasiform orifice subelliptical, broader than long. Operculum hemispherical, nearly fitting the orifice, the free end notched. A long seta is situated on each side of the orifice; two on the caudal end of the body; and two on the ventral surface of the body just cephalad of the middle. No traces of antennae or legs were found.

Adult ♀.—1.08 mm. long, yellow, eyes black; wings transparent, yellowish, covered with a white powder. Antennae of seven joints. Joints 3-7 fine, cylindrical, slender; joint 2 large, club-shaped. Legs long and slender, nearly reaching to the apex of the closed wings.

Hab.—On the underside of leaves of guava, *Psidium* sp., from S. Paulo, Brazil. Accompanied by a species of ant (*Creमतogaster*).

Aleurodes fumipennis n. sp.—*Pupa-case*.—Elliptical, convex, black, 1.8 mm. long. There is a prominent median longitudinal, dorsal ridge, and about six transverse furrows. The lateral margin is thick with a conspicuous groove on the dorsal surface, and a short fringe of white wax on the ventral surface. Near the posterior end, around the vasiform orifice, there is a large hemispherical area, nearly transparent, but dusted with white secretion. The lateral margin is slightly notched in places, but not crenulated. Vasiform orifice hemispherical; operculum small, rectangular, fitting the

orifice. Around the lateral margin there is a row of about 32 sharp sword-like hairs. A long seta is situated on each side of the orifice, and on the ventral surface, near the posterior end there are a pair of short setae. The remains of the legs and antennae can be seen on the ventral surface.

Adult ♀.—Brown; eyes large, black; length 1.63 mm. Antennae of seven joints; joint 2 large, club-shaped; joint 3 very long; joints 4-6 short, cylindrical, equal in length; joint 7 about half the length of joint 3. Wings large with the basal half and portions of the rest of the wing smoky.

Hab. On the underside of leaves of grass growing on swampy ground, S. Paulo, Brazil. It is also accompanied by a species of ant (Camponotus).

Aleurodes parvus n. sp.—*Pupa-case.*—Small, flat, black, oval; .94 mm. long; usually enveloped in a mass of white felt-

like hairy secretion. Dorsum with a longitudinal median ridge, and several transverse furrows. Marginal edge thickened, with a double row of crenulations. Vasiform orifice hemispherical. Operculum small, hemispherical, not filling the orifice. A long seta is situated on each side of the orifice. A pair of short setae extend caudad from the posterior part of the body; and another pair are situated on the ventral surface just cephalad of the middle.

Adult ♀.—Body very light yellow, eyes black; length .90 mm. Wings transparent, dusted with a white powder. Antennae short, slender, of seven joints. Joint 2 large club-shaped; joints 3-7 small cylindrical.

Hab.—On the under side of leaves of *Maytenus* sp. S. Paulo, Brazil.

S. Paulo, Brazil, May 15, 1896.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—III.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Entrapela (Selenia) alcipheraria Walk.—The eggs were kindly sent me by Miss Caroline G. Soule from Woodstock, Vermont. The moth which I bred was determined by Dr. Hulst. The larva is not previously described to my knowledge.

Egg. Regularly elliptical from top view, the surface flattened, but obliquely; outline somewhat wedge-shaped from the side, the top slightly hollowed. Surface shagreened not reticulated, shining. Dimensions .4 x 1 mm. Green when laid, dark red when received and finally black just before hatching.

Stage I. Thick and stout black Geometrids, the abdominal feet normal. Head bilobed, brown-black with pale setae; width about .5 mm. Body all dark velvety brown, the abdominal and anal leg plates bright red, contrasting; four tiny yellow dorsal dots (paired oval light areas on the posterior

edges of segments 5 and 7 which are not tubercles). Tubercles conic, distinct, but concolorous; setae short, dark, normal, with slightly swollen tips. Anterior edge of cervical shield and mouth reddish. The larvae drop by a thread on being disturbed and twist up into a knot.

Stage II. Head about .8 mm wide; all dark vinous black as before, but the little bright paired dots are supplemented by a fainter pair on joint 8 and tubercle i of joints 5 to 9 is produced into a rounded prominence. Head rounded, clypeus pale.

Stage III. Head rounded, brown with a short and thick black band on each lobe; width 1.2 mm. Tubercle i on joints 5 to 9 is high and subpapillose; white dots on joints 6 and 7 anteriorly. Body still largely brown, but diversified with gray in dorsal and subdorsal diffuse and dotted bands on joints 5 to

8, spreading into a transverse shade on joint 8 posteriorly and 9. Tubercle i of joints 6 and 8 is larger than elsewhere and lighter brown, with a dark tip. Thorax and joints 11 to 13 mostly dark.

Stage IV. Very angular and stick-like. Head flat before, the apex retracted, gray brown, darker streaked on the vertex; width 1.9 mm. Feet of joints 2 and 3 appressed, those of joint 4 protruded and with swollen bases; body angled sharply at joint 4 in rest; slender for joints 4 to 7, joints 8 to 13 much thicker; tubercles i on joints 5 and 6 enlarged; joints 8 and 9 swollen, forming collars, the tubercles prominent; joints 10 to 13 nearly smooth. Dark brown, frosted with gray; rusty brown dorsally, especially on the prominent parts; shaded with whitish behind joint 8; 11 to 13 dark gray. Below mottled gray and brown like bark. The prominent bases of the feet of joint 4 are light brown. The larva is much streaked and dotted; the dorsal paired pale dots are gone.

Stage V. No essential change. The head is about 2.7 mm. wide; there is a pair of thick anal prongs. The humps of joints 8 and 9 are variegated with shades of brown and whitish, especially a distinct dark triangle over tubercle i and a dorsal triangle alternating with this.

The species is single brooded. Eggs hatched the first part of June and larvae spun early in August, passing the winter as pupae. The moths emerged in May of the following year. The larvae fed on maple.

PROCEEDINGS OF THE CLUB.

12th May, 1899. The 209th meeting was held at 156 Brattle Street, Mr. J. W. Folsom in the chair.

The death was announced of Mr. Edward Winslow Cross, recently elected a member of the club.

Mr. S. H. Scudder read a letter from Clifford Pribble of Topeka, Kan., a boy of 13, upon night flying butterflies. He said that in the autumn of 1898 he had found *Anosia plexippus* almost every night and that on one occasion had taken *Amblyscirtes vialis* around lights.

Mr. J. W. Folsom read a paper on the number of segments in the head of insects. It was based upon embryological studies in the Collembola, Mr. Folsom arriving at the conclusion that it is composed of seven segments. The paper will appear in *Psyche*. Much discussion followed.

Guide to the Genera and Classification of the Orthoptera of North America north of Mexico. By SAMUEL H. SCUDDER. 90 pp. 8°.

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SUPPLEMENT TO PSYCHE,—II.

AN INDEX TO STÅL'S GENERA OF ORTHOPTERA.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Between 1860 and 1878, and especially during the eight years subsequent to 1870, years which witnessed his greatest activity in the study of Orthoptera, Stål proposed more than four hundred generic names for Orthoptera, many of them in minor papers now difficult to procure. The characters of these genera were largely elucidated by means of analytical tables, which were sometimes repeated in a fuller and more definite manner in some subsequent publication. To obtain a full knowledge of his limitations of these genera it is often necessary to refer to several places, and I therefore prepared for my own use and now publish as a convenience to others the following alphabetical index to these genera. No distinction is made between genera and subgenera, and the family to which each belongs is indicated.

Not to repeat titles too frequently in the index I give first a list of the papers in which the genera occur and prefix to each a Roman numeral which is used to indicate it in the index. These titles are arranged chronologically, though it should be noted that the last, which appeared after Stål's death, was actually presented to the Swedish Academy

more than three months before the one which precedes it, which was sooner published and to which the posthumous paper was in a sense introductory. The list contains two papers not quoted by Brunner in his *Révision du système des Orthoptères*, and omits one (*Recherches sur la système des Mantides*—1873) given by him, as it proposes no new genera. All the papers were published in Stockholm, and all but the first in octavo.

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- vii. *Recherches sur la système des Phasmides* (*Ibid.*, ii, no. 17) 1875.
- viii. *Observations orthoptérogiques*, [1] (*Ibid.*, iii, no. 14) 1875.

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PSYCHE.

MANUSCRIPT NOTES BY THE LATE T. W. HARRIS ON SAY'S INSECTS AND PAPERS.— I.

[The Harris library in the Boston Society of Natural History contains a very large number of separates of Say's entomological papers, including *all* the rarer ones, received by him directly from the author. These contain various MS. notes in pencil by Harris with a very few corrections or additions by Say himself; thinking that these may throw some light upon the time of publication of the papers or help determine the insects treated, I have here collected such as seem to have any present importance or interest, referring, for ready convenience, to the Complete Writings edited by Le Conte. A few comments of my own are added in brackets.—*Samuel H. Scudder*].

VOLUME I OF COMPLETE WRITINGS.

Page 74. *Tremex sericeus*. In the Western Quarterly Reporter is added: Length, exclusive of the oviduct, nearly one inch.

P. 74. *Tremex obsoletus*. In the W. Q. R. is added: Length $\frac{1}{2}$ of an inch. A male; the lateral abdominal spots are very indistinct.

P. 92. *Pompilus formosus*. In the W. Q. R. is added: Length of the body of

♂, $\frac{9}{10}$ of an inch; to tip of wings more than $\frac{1}{10}$? of an inch; of the body of ♀, 1 inch and $\frac{2}{5}$.

P. 98. *Phryganea fasciata*. In the W. Q. R. is added: Length to the tip of wings $\frac{9}{10}$ of an inch; of body nearly $\frac{7}{10}$ of an inch; of antennae $\frac{2}{3}$ of an inch; of superior wings nearly $\frac{9}{10}$ of an inch.

P. 111. *Philanthus canaliculatus*. Length $\frac{1\frac{1}{2}}{10}$ of an inch in W. Q. R.

P. 112. *Philanthus zonatus*. Length $\frac{1}{2}$ inch in W. Q. R.

P. 161. Article ix. Published probably first of April, 1823, John D. Godman, Editor.

P. 163. *Anomalon flavicornis*, line 3 add: and Massachusetts.

P. 164. *Plesia marginata*. We have one large species in Massachusetts, but not the *marginata*.

P. 164. *Sapyga subulata*. Pennsylvania. The wing nervures are not like those of *Sapyga* nor *Plesia* Jur., and I should be inclined to retain the genus *Elis* F., to which the insect certainly belongs. Illiger thought also that the genus *Elis* should be retained and the *sexcincta*, with the above, are by no means congeneric with *Plesia* Jur. According to Latreille, the recurved anal style is the character of the

male; if his observation be correct, the Carolinian species, *Tiphia namca*, *severia*, *obscura* will exhibit the anal style in the male. I have only one male of the present species.

P. 167. *Crabro* 10-maculatus, line 3; add: and Massachusetts.

P. 169. *Megachile latimanus*, line 4; add: and Massachusetts. Line 12, for tarsi, read posterior tarsi.

P. 176. Long's Second Expedition. Many of the species here described are stated to inhabit the "Northwest Territory." The region thus designated by Mr. Say corresponds to what are now called Wisconsin and Minnesota.

P. 189. *Cistela sericea*, line 7; for elytra, read elytral punctures.

P. 192. *Coccinella labiculata* var. α = *C. ocellata* var. Melsh., Cat.; var. β . = *C. ocellata* Melsh. Cat.

P. 192. *Rhynchites rubricollis*. A variety of *Anthribus collaris* [in Say's handwriting.]

P. 196. *Allica taeniata* [note to reference to *Crioceris vittata*]. This name should be striolata, a correction made by Fabricius himself in his Index Syst. Eleuth. Fabricius reserves the specific name vittata for a *Crioceris*, which does not belong to Geoffroy's genus *Haltica*, and which, as is observed by Fabricius, inhabits the cucumber vines in North America.

P. 214. *Dolerus arvensis*. var. β , black spot above wings obsolete.

P. 215. *Sigalphus sericeus*. In *Sigalphus* the abdomen consists of three segments, but in *Chelonus* of one. *Cryptus*

irrorator [see p. 216] is a true *Sigalphus*, while *oculator* and *sulcatus* are *Chelonis*.

P. 222. *Helychrum ventrale*. [Say corrects the last of the description so as to read]: terminal segments slightly longer than the preceding one, very obtusely and slightly emarginate at tip.

P. 225. *Ceropales bipunctata*, line 8; add after punctures: and a pale yellow spot just below the tip.

P. 226. *Bembex monodonta*, line 10; for base, read tip.

P. 231. *Crabro tibialis*, line 7; for postpectus, read pleura [correction by Say].

P. 259. North America *Curculionides*. The title upon the cover is as follows: Descriptions of new species of *Curculionides* of North America, with observations on some of the species already known, by Thomas Say. New Harmony, Indiana, July, 1831 [Received by Dr. Harris May 5, 1832.]

P. 266. *Chlorophanes acutus*. *Brachystylus harrisii* Schönh. in litt.

P. 278. *Erodiscus myrmecodes*. *Otidoccephalus americana* Schönh.

P. 279. *Balaninus rectus*. *B. rectirostris* Schönh., iii, 376.

P. 280. *Baridius trinotatus*. *B. vestitus* Schönh.

P. 281. *Baridius picumnus*. *Oliva-ceus* Say in litt. and Schönh.

P. 293. Supplement. [Received by Dr. Harris, Dec. 26, 1832.]

P. 295. *Cryptorhynchus palmarcollis*. *Curculio clathratus* Melsh. Cat.

P. 300. New species etc. found by Barabino. [See next entry.]

P. 310. Heteropterous Hemiptera. Only the first eight pages of this tract were printed in 1831, as is evident from the fact that on p. 19 [322 of Compl. Writ.] under *Pentatoma bifida*, Say's new species etc. found by Barabino [p. 300] is referred to, which was printed "January, 1832." All the remainder of this tract, therefore, must have been issued after that date. [The first signature also contains, on p. 5 [316], under the description of *Pentatoma hilaris* a similar reference. A copy of the original tract is in the Boston society of natural history.]

P. 364. *Belostoma fluminea*. [var. *a*, immaculatus does not appear in the first Barabino pamphlet.]

P. 369. Correspondence. See Southern Agriculturalist, Charleston, S. C., Vol. i, p. 203. [There follows in the Disseminator an apology to Dr. Capers for publishing his letter without consult-

ing him, signed T. S. Dr. Harris's copy of this Correspondence is bound up with a New Harmony pamphlet (Compl. Writ., ii, 521) as a leaf from the Disseminator (with other matter) pasted between the title page and the paper proper and unnumbered; whether it was printed earlier or later does not appear; my own copy of the pamphlet does not contain it.]

P. 373. Description of Hymenoptera. [Dr. Harris gives January, 1829, as the date of publication.]

P. 387. line 1; for scutel, read suture.

P. 390. *Elater unicolor*. Nails pectinated.

P. 393. *Elater erosus*. Compare this with *Eucnemis atropos*; it is possible it may be congeneric.

P. 395. *Elater silaccus*. Length nearly three tenths of an inch.

P. 395. *Elater rubricus*. Abdomen black.

ON ALEBRA AND RELATED GENERA.

BY C. F. BAKER, ST. CROIX FALLS, WISC.

The Typhlocybid genus Alebra is separated from others of the tribe by the fact that the elytron possesses a well developed appendix. The wing resembles that of the higher Jassids in being distinctly margined, and with three apical cells.

There are in my collection fourteen Brazilian species of the Typhlocymini in which the elytron possesses an ap-

pendix. As far as the wings are concerned, however, twelve of these species are not at all like Alebra, as in these the margin of the wings is entirely obsolete around the apex.

Five of these Brazilian species which I had loaned Mr. Gillette were described under Alebra in his late paper on the Typhlocymini. (Proc. Nat. Mus. XX). Only one of these (*dor-*

salis) was a true Alebra. The other four (part of the twelve mentioned above) are not Alebra, and although in one species a wing is figured, yet no mention is made of its peculiar structure. These species, which Gillette describes under Alebra, could not possibly be placed in that genus by the use of his own synopsis immediately preceding the descriptions.

The last of the fourteen species mentioned above differs from all the rest in wanting the elytral appendix, though it possesses a typical Alebra wing and has the general habitus of an Alebra. It represents the type of a new genus which I shall call *EUALEBRA*.

The relation of these genera to others of the tribe Typhlocybini may be shown best in tabular form, as follows:—

Appendix present.

Wing distinctly margined around apex, *Alebra*.

Wing with margin obsolete around apex, *Protalebra* n. gen.

Appendix absent.

Wing margined and with

Three apical cells (exclusive of costal), *Eualebra* n. gen.

Two apical cells.

Body short, robust, * *Erythria*.

Body comparatively long, slender, *Dicraneura*.

One apical cell, *Empoasca*.

Wing not margined and with

Three apical cells, *Eupteryx*.

Two apical cells, *Typhlocyba*.

Eualebra smithii n. sp.—Length 3 mm. Vertex very large, as long as pronotum, roundly angled in front and swollen out laterally a little in front of the eyes, this last being a character not before observed in the tribe. The face in the single specimen collapsed in drying. Head and below sordid whitish. Margin of vertex above antennal sockets, apex of first antennal joint, middle femora apically and middle tarsi at base, blackish. Pronotum and basal angles of scutel with fairly numerous small brown dots, the former in the middle behind with a large brown cloud; the latter with two larger round dots at middle, and apex, dark brown.

Elytra smoky subhyaline, with brown markings, the base of the clavus suffused with sanguineous. Base and apex of clavus, base of corium and entire apical portion to just within the anteapical cells, with fine brown dots. A very irregular brown band extending from middle of clavus to apex of costal cell. A large rectangular white spot on middle of costal area.

Described from a single male in the Herbert H. Smith collection, taken at Chapada, Brazil. This prettily marked little species presents more remarkable characters than any other Typhlocybid known to me, and is the type of the genus.

Protalebra singularis n. sp.—Length 3.5 mm. Vertex strongly produced and angled apically, plane, as long as or a little longer than pronotum. Basal half of vertex, pronotum, and basal half of scutel, orange, darker on the pronotum. Hind margin of pronotum narrowly white, the white narrowly margined internally with black. Anterior margin of head narrowly black, bordering this below

* This group has no known representatives in the American fauna. Its reduction would only be justified by a study of very complete and extensive European material. European students who have had that opportunity consider it distinct. The difference in form, provided it is constant throughout the two assemblages of species, is as good a generic character as any.

narrowly white, still below this on upper part of front more broadly black. Face below blackened, otherwise pale yellow, as are also the legs except tips of tarsal joints which are black. Sternum blackened.

Elytra golden brown, faintly dotted with paler; a spot at base of corium, a narrow oblique line crossing elytra from apical third of corium down and back to costa, and apical portions of second and third terminal nervures, white. All apical and the two sub-apical cells smoky subhyaline. The elytra in this species are very remarkable in that they possess two anteapical cells, an occurrence unparalleled in the Typhlocybini, and the three specimens I have are all alike in this respect. Not only does the wing indicate its true relationship, but the three very closely allied species, *similis*, *ninettae* and *unipuncta*, possess the normal elytral venation.

Female valve with a stout, median, triangular, black, margined tooth, the lateral angles broadly rounded.

Described from three specimens in the Herbert H. Smith collection, taken at Chapada, Brazil, in April. Of these, one has lost its abdomen, the other two are male and female. The plane vertex margined anteriorly with white and black gives this species a striking resemblance to *Scaphoideus*.

Protalebra similis n.sp.—Length 3 mm. Closely resembling *singularis* but smaller; elytra without anteapical cell, and proportionally shorter. Vertex, pronotum and scutellum colored the same as in *singularis* except somewhat brighter. Face, sternum and venter except last segment, blackish brown. Elytra with general plan of coloration as in *singularis*. Veins of clavus back of diagonal white band black, this band on corium proximally margined with black. Cubital vein black except for two small whitish interrup-

tions, and costal cell apically with a diagonal black spot. The golden brown portions of basal half of elytra without the minute pale dots found in *singularis*.

Described from three specimens in the Herbert H. Smith collection, male and female, taken at Corumba, Brazil, in April. The resemblance to *singularis* is remarkable.

Protalebra ninettae n. sp.—Length 2.5 mm. Form of *singularis*, but vertex slightly convex, giving the head a somewhat tumid appearance. Head pale yellowish, a large round spot on tip of vertex and one on either side just below edge of vertex black; lower part of face bright sanguineous. Pronotum orange, the hind margin white bordered before with black as in *singularis*, but the black line extended forward on to the disc of the pronotum in two large black teeth; between these teeth white with a small black spot. Scutellum orange, the apical half white. Costal and apical portions of elytra whitish or smoky-subhyaline, a large spot at middle of costal area, and the veins surrounding outer apical cell, blackish. Rest of elytra pale golden brown, with a white band reaching from brachial nerve on one side across apex of clavus to the brachial nerve on the other side. This white band is not oblique, and is bordered proximally with blackish, the veins back of it blackish.

Described from a unique specimen in the Herbert H. Smith collection, taken at Chapada in August. The species of *Protalebra* are about the most delicately beautiful Jassids I have ever seen, not even excepting certain *Tettiogonias*, and this species is the gem of the genus. On this account, I have dedicated it to my wife, who has been of the greatest assistance to me in my scientific work.

Protalebra unipuncta n. sp.—Length 3 mm. Resembling *ninettae* but larger. Head very bluntly angled in front, scarcely three fourths the length of the pronotum. Head and all below pale yellowish, apex of the former with a large, round black spot, vertex brownish towards the base. Pronotum pale golden brown, the hind margin narrowly obscure whitish; in front of this whitish margin, medially with two large oblong black spots which diverge forward, on either side of these is a small black spot; anteriorly with a median blackish dash. Elytra golden brown, an extensive costal area smoky subhyaline, the apical veins whitish; a diagonal white band extending from apical two-thirds of clavus down and forward but a short distance on to corium, this band anteriorly margined with blackish. Clavus with two longitudinal black dashes, the outer shorter. Female valve strongly rounded behind.

Described from four specimens, male and female, in the Herbert H. Smith collection, taken at Chapada in January. The four species, *singularis*, *similis*, *ninettae*, and *unipuncta* form a group of very closely allied species. While alike in general appearance, after the manner, for instance, of *Tettigonia rufipes*, *12-punctata*, and *crassa*, or the members of the *colorata* group, still their differences are striking and unmistakable.

Protalebra vesillifera n. sp.—Length 3.5 mm. Vertex rather strongly but roundly and almost tumidly angulate in front, the vertex convex. Color very pale yellowish. Peduncle of antennae, a median spot on anterior portion of pronotum, and a spot on propleura extending up to hind angles of pronotum, brick red. Pronotum posteriorly ivory white. Scutellum with a black band across tip, leaving only a minute white point beyond. Elytra with a broad white sub-

diagonal band passing from middle of claval commissure to costa, where it is reflexed and extended diagonally upward and backward to the transverse veinlets in a boot-shaped white stripe; the transverse white band is narrowly margined before with blackish, behind with sanguineous. Other than the markings, the elytra are pale sordid yellowish basally, becoming smoky subhyaline apically. Inner apical cells with a large whitish hyaline area.

Described from one female and three males in the Herbert H. Smith collection, taken at Chapada, Brazil, in April.

Protalebra terminata n. sp.—Length 3.5 mm. Vertex shorter than pronotum, rather strongly but almost tumidly angulate, convex above. Face rather tumid and greatly lengthened. Pronotum, head, and all beneath pale sordid yellowish. Two small golden dashes on middle of pronotum, the median line sometimes white. Elytra before transverse veins whitish subhyaline marked with golden; clavus with an irregular spot at base and an incomplete circle at middle; corium with three equidistant, fine, transverse, wavy lines. Beyond the transverse veins, uniform deep, smoky in some cases, in others this cloud is broken up more or less by round hyaline spots.

Described from four females and one male in the Herbert H. Smith collection, taken at Chapada, Brazil in April.

Protalebra amoena n. sp.—Length 3 mm. Form much as in *terminata*. Pale yellowish, vertex, a broad median portion of pronotum and inner basal margins of elytral broadening to middle of claval commissure, washed with sanguineous. Elytra hyaline with two golden clouds in region of brachial cell, the apical one smaller and inclined to reddish. Inner apical margin of elytra irregularly fuscous.

Described from a single male in the Herbert H. Smith collection, taken at Chapada, Brazil, in January.

Protalebra brasiliensis n.sp.—Length 2.75 mm. Face elongate, vertex shorter than pronotum and tumidly angulate. Color sordid yellow. Vertex with three dark dots on basal margin. Pronotum and scutel dark fuscous; the former with three minute light dots anteriorly and four larger in a transverse row behind; scutel with a slender median line and a dot on either side light. Elytra with large lemon yellow areas as follows: one at base, one at middle of corium, and a common commissural area resting on apex of clavus; the basal area is just before basal margin and extends from costa to brachial cell; both are diagonal, extending up and back. The interspace between these areas is dark smoky, becoming lighter apically, the lips hyaline. The dark interspace with hya-

line spots, which are particularly noticeable just beyond transverse veinlets.

Described from many specimens in the Herbert H. Smith collection, taken at Chapada and Corumba, Brazil, from January to April. This species has somewhat of a resemblance in the character of the markings to certain *Typhlocybas* of the *comes* group.

Protalebra curvilinea (Gill.)

Protalebra bifasciata (Gill.)

Protalebra trimaculata (Gill.)

Protalebra robusta (Gill.)

These four species described under *Alebra* by Gillette, belong in *Protalebra*, of which genus *curvilinea* may be taken as the type. The types of all the species discussed above are now in the National Museum.

SOME CALIFORNIA BEES.

BY CARROLL FOWLER, DUARTE, CAL.

HERIADES Spinola.

One specimen belonging to this genus has been collected at Berkeley, and it represents a new species. The only other species recorded from this State is *H. albicinctum* Prov. from Los Angeles.

Heriades glaucum n. sp. — ♂. Length 5.5 mm. Bluish-green, clothed with thin white pubescence. Head broader than thorax, dark green, finely punctured, clothed with long white pubescence, dense on clypeus and cheeks; mandibles black. Antennae brownish-black, reaching to the base of the abdomen. Thorax dark bluish-green, finely and densely punctured, clothed with long pubescence, denser on metathorax and pleu-

ra. Wings with a brownish tinge darker in marginal cell; second submarginal cell a little longer than the first, narrowed nearly one half toward the marginal and receiving the first recurrent vein one fourth its length from base and the second one fifth from tip. Legs dark green, clothed with thin white pubescence, on tarsi beneath yellow; tibial spurs and claws brownish. Abdomen dark bronze-green with bluish reflection in certain lights; densely punctured, narrow apical margins of the segments smooth and pale brown; the whole clothed with a very short thin white pubescence longer and denser on the apical segments and venter.

Habitat. Berkeley, Cal. May 1. One specimen.

CALLIOPSIS Smith.

The following are the California species of *Calliopsis* in the collection of the University of California. All except *C. atriceps* are new to this State. The synopsis will serve to separate these.

First recurrent vein uniting with the second transverso-cubital vein.

Clypeus of ♂ yellow; ♀ with apical plate narrow, veins black . . . *clypeatus*.

Both ♂ and ♀ entirely black; ♀ with apical plate fairly broad, veins pale . . . *atriceps*.

First recurrent vein received by the second submarginal cell some distance from the second transverse-cubital vein.

Abdominal bands entire.

Postscutellum white . . . *scutellaris* ♂

Postscutellum black . . . *cinctus*.

Abdominal bands interrupted.

Abdomen with four yellow bands, the first two broadly interrupted on the disc . . . *visaliensis* ♀

Abdomen with five yellow bands, broadly interrupted laterally narrowly so in the middle . . . *anthidius* ♀

1. *Calliopsis clypeatus* Cress.—St. Helena, Cal., March 26. Fourteen specimens collected upon *Brassica campestris*. The ♀ differs from ♂ in being a little larger, of a duller black color, and having no yellow on the clypeus. Previously recorded from Colorado.

2. *Calliopsis atriceps* Cress.—Berkeley, Cal., March and April. Many specimens collected upon *Brassica campestris* and *Ranunculus californicus*. The female resembles the male very closely. They vary in length from 6 to 8.5 mm.

3. *Calliopsis scutellaris* n. sp.—♂. 7.5 to 8 mm. Black with yellow markings; postscutellum white. Head black, very finely but not closely punctured, uniformly clothed with white pubescence; spot between antennae and face beneath—except two small spots on the clypeus, one in the suture on each side of the clypeus, and one on the labrum—

sides of the face extending up almost as high as the anterior ocellus, and mandibles except tips yellowish white. Antennae white with a dark line above which toward the tips spreads out covering nearly the whole of the last three joints. Thorax black, densely punctured, clothed with rather dense white pubescence, sometimes tinged with yellowish above, sparse on disc of metathorax; tubercles except sometimes a brown spot on the middle, tegulae except an irregular brown patch near base, postscutellum and narrow line on scutellum, white. Wings hyaline, veins pale brown. Legs yellow, coxae and trochanters except at joints, and femora at base, and beneath except at apex, a large spot on all the tibiae beneath and a small one on the posterior tibiae above (sometimes indistinct) and sometimes the apical joints of the posterior tarsi black; pubescence on the legs white. Abdomen black, with broad yellowish or whitish bands on segments 1-5, narrowed slightly on the middle and more or less notched with black on the lateral apical portions; pubescence thin and whitish, becoming longer and denser toward apex. Venter black.

Habitat. Fresno, Cal. (H. O. Woodworth), May 4-9. Seven males, collected upon *Melilotus indica*.

4. *Calliopsis cinctus* Cress.—Telachapi, Cal. (H. O. Woodworth), May 12. One male. Previously recorded from Nevada.

5. *Calliopsis visaliensis* n. sp.—♀. 7.5 mm. Black, abdomen with four yellow bands, the first two broadly interrupted on disc. Head black, finely and densely punctured on vertex, thinly and coarsely so on clypeus; clothed with whitish pubescence, very thin on clypeus; the lower lateral corners of the clypeus, a small spot on the middle near the apex, three spots just above the clypeus and the lower corners of the face yellow; mandibles black at tips and brownish or yellowish at base. Antennae black, becoming pale brown toward apex beneath. Thorax piceous-black with white pubescence

slightly tinged with yellow above, short on disc of mesothorax and sparse on disc of metathorax. Wings hyaline, veins brown. Legs black, more or less brownish on tibiae and tarsi, the four anterior tibiae white at base and on the anterior pair extending down a short distance in front is a brownish-yellow line; pubescence whitish tinged with yellow on tarsi beneath. Abdomen black, shining, almost nude except at base where there are some white hairs and at apex where the pubescence is rather dense; yellow bands on segments 1-4, those on 1-2 broadly interrupted on the disc and on 3-4 very slightly so; all are somewhat margined on the lateral apical portions. Venter black, apical margin of the segments brownish.

Habitat. Visalia, Cal. (H. O. Woodworth), May 9. One specimen.

6. *Calliopsis anthidius* n. sp.—♀. 10 mm. Black, abdomen with narrow yellow bands broadly interrupted on the sides. Head black, very finely and densely punctured on vertex; clothed with whitish pubescence, tinged with yellow above; all of the face beneath the antennae except three small

spots on clypeus near the base and one on the labrum, and mandibles except tips, yellow; the yellow on the sides of the face extends up a little higher than the antennae. Antennae black, flagellum pale yellowish beneath. Thorax entirely black, clothed with a dense whitish pubescence which has a brownish-yellow tinge above. Wings smoky becoming darker toward apical margins; veins black. Legs clothed with short white pubescence; black except a line on the anterior femora and on all the tibiae in front (interrupted on middle of posterior pair) and the tarsi entirely except a narrow black line on posterior pair behind, and the claws which are more or less brownish, yellow. Abdomen black, clothed with a very short pale pubescence; segments 1-5 with narrow yellow bands each slightly interrupted on the middle and broadly so latterly forming thus four elongate spots on each segment, those on the sides being the broadest. Venter black.

Habitat. Tulare, Cal. (H. O. Woodworth), May 10. One specimen.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—IV.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Therina endropiaria Grt. and Rob.—The mature larva has been described by Goodell (Can. ent. xi, 194). His description, though short, is correct, if the structures that he calls "tubercles" be understood to be low rounded prominences of the skin and the words 6, 8 and 7th segments be changed to 6, 8 and 9th. Further as Goodell does not count the head as joint 1, his numbering of the segments should be increased by one in each case to correspond with mine.

Egg.—Several together, usually in a straight row of 5 to 9, sometimes more; irregularly elliptical, scarcely flattened, one end distinctly truncate, a little convex with a

rounded rim. Neatly, distinctly reticulate, the cell areas resembling round pits, the pitting extending also over the truncate end. Slightly bluish green, shining, soon turning dull reddish with a dark spot on the truncate end. Size .6 x .4 x .3 mm.

Stage I. Head round, pale brown; width about .3 mm. Body whitish translucent, a rather broad pale cinerous subdorsal band, leaving the dorsal and lateral areas pale. Setae fine, pointed, white, obscure. Appearance pale grayish, obscurely marked. After eating they became translucent green, the head brown, no marks.

Stage II. Head round, slightly bilobed,

pale brown; width .5 mm. Body smooth, slender, whitish green, finely creased annulate, not shining, no marks, no projections.

Stage III. Head round, slightly bilobed, broad, green, slightly brown dotted on the sides of the lobes; width .9 mm. Body smooth, green, a little whitish, especially on the substigmatal fold above which is a faint darker green band on joints 3 to 13, or this band may be blackish; spiracles black. The segments are annulate on the anterior half ventrally. The larvae sit at an angle with a supporting thread from the mouth.

Stage IV. Head rounded, bilobed, green, a reddish suffusion on the side; width 1.3 mm. Body green, sordid on the thorax and joint 13, elsewhere opaquely yellowish green; a brownish suffusion on joint 10 stigmatally; spiracles on joints 5 to 9 in black patches. The elongated central segments are folded-wrinkled on the posterior third; lateral fold rather distinct. The skin is smooth, almost without marks.

Stage V. Head as before, the brown patch on the side larger; width 1.8 mm. A stigmatal shade on joints 10 to 13 and patches on 6 and 7 distinct. Tubercle ii of joints 7 and 10 a little enlarged and shaded with brown. Otherwise smooth, opaque yellowish green, a little shaded with brown; a brown dot on joint 3; tubercle iv black the whole length; joint 8 more or less distinctly colored. There is much variation in different larvae in the amount of brown; the poste-

rior end, joints 10-13, may be all brown and a large patch on joints 6 and 7.

Stage VI. Head green only centrally and on the vertex, heavily shaded with purplish brown over the side of each lobe, darkest posteriorly; rounded, bilobed, higher and wider than joint 2; width 2.5 mm. Body cylindrical, smooth; a collared elevation on the dorsal half of joint 7 (tubercles ii and iv); ii and iv of joint 10 and iv of joint 6 with slight elevations or joint 6 even collared on the ventral half; the dorsal tubercles all a little prominent especially on joints 3, 9 and 10. Color dull, not shining; under ground green, all shaded with purplish brown, the exact amount varying. Joints 10 to 13 are nearly entirely shaded, the venter of these and of 2 to 4 contrastingly pale green. There is a dark spot on tubercle iv of joints 5 to 9 with a tendency to transverse bands. Tubercles dark, relieved by white patches in the dark and prominent parts. Spiracles black, ringed with whitish outer shades. Anal plate rounded; two subanal prongs. The larva resembles a twig that is partly green. One example was all brown except on the face and dorsally on joints 2 and 3.

Eggs were obtained at Brookhaven, Long Island, N. Y., late in June and the larvae spun towards the end of August, passing the winter as pupae. Fully grown larvae were found at Morris Plains, N. J.

Food plants. Red and white oaks and chestnut.

A. SMITH & SONS, 269 PEARL STREET, New York.



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PSYCHE.

MANUSCRIPT NOTES BY THE LATE T. W. HARRIS ON SAY'S
INSECTS AND PAPERS. — II.

VOLUME II OF COMPLETE WRITINGS.

P. 24. Descriptions of the Myriapodae. [An issue of this paper with title page as follows: "Descriptions of the Myriapodae of the United States. By Thomas Say. Read November 21st, 1820. J. Harding, printer. 1821," 14 pp. without pagination, 8°, does not seem to have been seen by Dr. Le Conte. It is in the library of the Boston society of natural history.]

P. 52. *Beris fuscitarsis*, line 1; after black, add: or dark green.

P. 53. *Pangonia incisuralis*. *P. incisa* Wied.

P. 103. *Buprestis 6-guttata*. Preoccupied; sexsignata Say [Say's handwriting.]

P. 104. *Buprestis gibbicollis*. Also preoccupied; diserta Say [Say's handwriting.]

P. 104. *Buprestis granulata*, line 3; add: and Indiana [Say's addition].

P. 116. *Lycus terminalis*. Indiana [Say's addition].

P. 142. *Melolontha hirsuta*. Closely resembles quercina, but distinguished by punctures. Certainly hirticula of Knoch, Neue Beytr., 79 [cf. reference to p. 297].

P. 143. *Melolontha pilosicollis*, line 20. Tristis Fabr. is placed by Schönherr in the subdivision of *Melolontha* corresponding with Megerle's genera *Anomala* and *Anisoplia*; therefore it must be nearly or quite generically distinct from the *pilosicollis* of Knoch and Say.

P. 159. *Cistela sericea*. *Serica* [Say's correction.] This is a different species from the *sericea* of Say in Long's Expedition, which has priority; it is possible that the present species may be the *sulphurea* of F.

P. 162. DORTHESIA. This name belongs to the family of Aphidae and is so used by Latreille and Leach. I do not know with what propriety Mr. Say used it for a coleopterous insect; it is mentioned as coleopterous in Rødne animal, iii, 313.

P. 173. *Curculio acutus*. New genus. *Brachystilus* Schönh. in litt.; *B. harrisii* Schönh. in litt.

P. 190. *Saperda calcarata*, line 3; add: and Massachusetts.

P. 190. *Saperda bivittata*. *Bifasciata* Melsh.

P. 199. *Rhagium trivittatum*. Randall's *Leptura vittigera* is hardly more than a variety of this insect. It is a *Toxotus*.

P. 202. *MOLORCHUS*. [Corrected to *Malthinus* by Say.]

P. 205. *Hispa obsoleta*, line 1; for thorax, read elytra.

P. 213. *Colaspis IO-notata*. *Maculatus* K. in Say's Cabinet.

P. 220. *Galeruca coryli*, last line; add: also on *Ulmus*.

P. 232. *Coccinella mali*. Allied in size and markings to *C. borealis* F., but in that the common basal spot is wanting and the spots are arranged 3, 3, 1, the two sutural ones being common.

P. 238. *Gryllus bivittatus*. We have one species [*Melanoplus femoratus*], similar to the above with vittated elytra and thorax, but it has the posterior tibiae sanguineous; the female is nearly twice as large as the male.

P. 239. *Tridactylus apicalis*. [Apicalis in Journ. Acad. Philad.]

P. 260. *HISTER*, line 3; for entire or one abbreviated, read: entire or one entire and one abbreviated.

P. 261. *Hister memnonius*, lines 1 and 5; "inner" probably error for "outer."

P. 267, line 1; for tarsi, read tibiae.

P. 277. *Cantharis jactata*. Toothed nails.

P. 277. *Cantharis parallela*. Toothed nails.

P. 278. *Cantharis laticornis*. Posterior nails toothed.

P. 278. *Cantharis scitula*. Toothed nails; it varies in having a fuscous spot or line on the thorax, but not so long a one as in *parallela* etc.

P. 281. *Anobium tenuestriatum*. How does it differ from *panicum*?

P. 285. *Necrophorus orbicollis*. The thorax is much more accurately rounded in the ♀ than in the ♂.

P. 297, last line but 6, *M. hirticula*. *Hirsuta*? [cf. reference to p. 142.]

P. 312. *Anthrribus notatus*. *A. lugubris* Oliv.

P. 315. *Attelabus pubescens*. *A. rhois*? Schönh., i, 202.

P. 316. *Apion rostrum*. *A. sayi* Schönh., i, 252.

P. 340. *Lema melanocephala*. *L. meridigera* F. The specimen sent by T. W. H. was undoubtedly identical with the European species. It was given with other insects by Mrs. Peck and probably was brought from Europe by the late Prof. Peck.

P. 343. *Helodes trivittata*. It is proportionally broader than the *phellandrii* of Europe and the *vittata* (Oliv.) of Carolina.

P. 435, note. [The copy referred to is now in the library of the Boston society of natural history. It was not received by Dr. Harris till Aug. 1, 1826.]

P. 439. *Brachinus fumans*. *B. cyanipennis* Say, Journ. acad., iii, 143.

P. 456. *Harpalus pennsylvanicus*. Head proportionally more robust than in bicolor; thorax not broadest at base, not square.

P. 458. *Lebia ornata*. *L. analis* Dej.

P. 459. *Lebia hylacis*. A misprint, doubtless, for *hylaesus*.

P. 461. *Harpalus agricola*. *A. lucuosus* Dej.

P. 469. *Feronia sigillata*, line 2 of

page, "two . . . punctures." Is this correct?; in my specimen, named by Say, there is only one puncture.

P. 469. *Feronia placida*. From a specimen wanting the head and thorax, in Say's cabinet, it is certain that this is no other than *Agonum morosum* Dej., No. 1090 Harr. Coll.

P. 470. *Feronia muta*. *Omascus politus* H.

P. 471. *Feronia impunctata*. Incorrectly referred to *Amara familiaris* by Dejean. This cannot be an *Amara* and certainly not the *familiaris*, which has a differently shaped thorax and no deep punctures on the third elytral stria, and is much smaller with bronzed elytra etc. Only one elytron of this insect remained in Mr. Say's cabinet, the shoulder formed as in *Feronia decens* and the marginal punctures are as in the allied species of *Anchomenus*, 1316 and 1302 Harr Cab. The marginal and submarginal striae are not deeper than the others and there is a regular series of large punctures on the submarginal stria, not serrated as in *Argutor*, *Omascus*, etc. On the whole, I presume that the *impunctata* is an *Anchomenus*, if the *F. decens* and my Nos. 1316 and 1302 belong to the genus.

P. 473. *Feronia autumnalis*, line 2; after edge, add: of the thorax. Is a *Harpalus*; specimen in Say's Cab., and one from Melsheimer.

P. 476. *Feronia nutans*. *Striato-punctatum* Dej. teste Say.

P. 477. *Feronia decora*. An *Anchomenus*.

P. 477. *Feronia decens*. An *Anchomenus*.

P. 488, 489. *Dicaelus purpuratus*, *D. violaceus*. These two differ only in size and from the specimens in Say's cabinet are evidently identical, and are both to be referred to the *violaceus* of Dejean.

P. 511. *Colymbetes nitidus*. From Say's specimen it is evident that this is only a variety of his *obtusatus* in which the fenestrate spots are less distinct or obsolete.

P. 521. Descriptions etc. [The title of the original pamphlet, referred to in Dr. LeConte's note reads: Descriptions of new species of North American insects etc. A copy, from Dr. Harris' library, in the Boston society of natural history, enables me to give the following details. It is composed of 84 pp., the first being the title page and the reverse blank. The title bears date 1829-1833, but the first sheet after the Correspondence bears date in ink in Say's writing "March 17, 1830," and the last pages, beginning on p. 73½ and received by Dr. Harris from Mrs. Say (after Say's death) in November, 1834, bear printed date Aug. 1, 1834. The third and fourth pages are a leaf from the Disseminator*, with, among other matter, the Correspondence about the cotton plant insect (see reference above to vol. i p. 369). After this comes the article proper: 1st, four unnumbered pages

* Perhaps merely pasted into Dr. Harris's copy, as it is not found in mine.

in double columns, marked by Dr. Harris as received Sept. 28, 1830. 2d, fourteen pages, the last blank, in single narrow newspaper columns, evidently the columns of the Disseminator, and unnumbered. 3d, fifty-six ordinary pages (numbered 18-65, 46-53—corrected in pencil to 66-73); of these pp. 18-41, bearing date August 20, 1830, were received by Dr. Harris Aug. 11, 1834; pp. 42-49, Oct. 21, 1831; pp. 50-57, Sept. 24, 1832—Dr. Harris remarks: "probably no more printed before Nov. 2, 1832, when the preceding pages were read to the Philosophical Society"; pp. 58-65, July 21, 1833?; pp. 66-73, July 21, 1834—Dr. Harris adds at the end of this: "All the foregoing seems, by the copies done up by Mr. Say's orders, to have been printed before 1834, the last sheet [of 8 pp.] probably in 1833, with the title." 4th, eight ordinary pages in smaller type, numbered 73½, 74-80, dated in print Aug. 1, 1834 and received by Harris from Mrs. Say in November. These last eight pages are not mentioned by Dr. LeConte, and continue the descriptions of species of *Elater*, species 16-48, found on pp. 603-614 of the Compl. Writ. Dr. Harris however, states on his copy that the title page "was issued to include all that has been printed as far as end of page 65." My

copy contains eight pages more than that.]

P. 528. *Clivina quadrimaculata*, line 5; for punctures, read spots.

P. 531. *Chlaenius circumcinctus*. Length over $\frac{2}{3}$ of an inch—Disseminator.

P. 593. The footnote is wanting in the New Harmony pamphlet.

P. 596. *Agrilus bilineatus*. "A variety occurs in Indiana, which instead of having the vitta etc. fulvous, has them silvery; another variety has the vitta obsolete" (omitted by printer).

P. 600. *Elater viridipilis*. [viridipennis in the New Harmony pamphlet, to which Dr. Harris adds: viridipilis in the original manuscript and in the Annals Lyceum N. Y., i, 257].

P. 609. *Elater fenestratus*. Cannot find any description of fenestratus.

P. 611. *Elater inquinatus*. The penultimate joint is not lobed; it is only oblique and the last one slender, which gives the semblance of a lobe.

P. 660. *Oedema apicalis*. [Apicalis in the first Barabino pamphlet].

P. 671. *Scymnus terminatus*, line 2; add: and Massachusetts.

P. 676. *Allantus epinotus*. Sambuci Harr.

P. 782. *Megachile pollicaris*. [Megachile pollicaris in the first Barabino pamphlet].

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDÆ.—V.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Gonodontis hypochraria H.-S. I have described this larva previously (Ent. News, V, 61), but the present description is more full and exact.

Egg. Regularly elliptical from upper aspect, one end depressed, wedge-shaped from side aspect, the thicker end obscurely truncate, consisting only of a slight flattening; surface neatly hexagonally reticular, the reticulations distinct and raised, very narrow, but with rounded tubercles at the angles as large as one third the diameter of a cell area. On the side taking the light, the tubercles are dark, pale on the dark side, and on the edge view plainly protruding. The egg is well rounded, without sharp angles; color shining greenish white, opaque; later opaque pink and finally gray-black. Size $.8 \times .6 \times .5$ mm. Hatches in 10 days.

Stage I. Head large, round, dark brown on vertex, face strongly mottled with white; width about .25 mm. Joints 5 to 9 enlarged a little centrally by small blunt processes bearing tubercle iii; otherwise smooth. Ground color white; all of the thorax, joints 10 to 12 dorsally and large diamond shaped dorsal patches on joints 5 to 9 dark vinous brown, joined by a narrow dorsal line and a finer subdorsal one; feet dark; venter with large spots connected like the dorsal ones and joining those somewhat narrowly on the sides. Setae small, stiff, dark, not perceptibly glandular; tubercles obsolete. The larvae progress slowly and are rather sluggish. Later the pale spaces are cut by several dusky lines, being resolved into a number of white spots. A dorsal pair on the anterior edge of the segment are a little elevated while the brown elevations are less conspicuous. Anal plate edged with pale.

Stage II. Head thin, flat before, disk-like, shallowly bilobed; red-brown, spotted with

white; four spots in front cover most of the surface, clypeus pale; two spots on the narrow sides; width about .5 mm. Body essentially as before, the lateral blunt, brown processes present on joints 5 to 9, segments banded irregularly centrally with red-brown, connected by a number of indistinct brown lines; interspaces broadly luteous, with many small bright white spots. On joints 8 to 13 the brown dorsal band predominates and the segmental bands are fainter, being absent on joints 10 to 13. Thorax all dark above, feet pale, abdominal feet dark. Brown ventral stripe rather distinct. Later the brown color fades and only the low processes (post stigmal) remain dark.

Stage III. Head rounded, squarish, scarcely bilobed, half as thick as high, whitish, dotted with brown, forming a border about the face which has the clypeus and four spots confluent therewith whitish; vertex and sides traversed by three brown pulverulent bands on each lobe; width about 1 mm. Body cylindrical, smooth, the thorax contracted, bent backward at joint 5, all the feet appressed, the thoracic segments compressed laterally. Greenish brown, not dark, except around the very slight elevation behind and above the spiracle (tubercle iii) and in three spots subventrally in an oblique row and very slight dashes in the center of the segments. A dark dorsal line and mark on the foot of joint 10 in front, subventrally on joints 11 to 13; thorax darkly shaded. A number of very fine dotted white, longitudinal lines, viz.: addorsal, obscure; subdorsal, more distinct and on joints 6, 7 and 8 anteriorly breaking up into two or three rather large white spots, the most anterior of which is placed inward, next the dorsal line; there are three other lines on the sides and three subventrally, the last forming a

double ventral line. The lower two of the side lines are somewhat broken by large white spots on the anterior portion of joints 6 and 7. Lines lost on the thorax. Other examples are more heavily shaded with dark brown so that the lines are broken, especially centrally on the segments.

Stage IV. Head flat before, sides and vertex continuous and of even width, a slight shallow notch. Face with an irregular pale mark composed of a white clypeus and four confluent dots, surrounded by a dark brown border, dotted with white; sides and vertex white, mottled with brown, especially in the center of the side posteriorly and in vertical notch; width about 1.5 mm. Body cylindrical with slight subventral ridge, thorax somewhat smaller; anal plate large, triangular, not cornified; tubercle iii in a slightly elevated black spot. Brown, finely streaked longitudinally with white, intermixed with a few black dots. An obscurely double, blackish dorsal line, each side of which on joints 6, 7 and 8 are two white dots, the anterior one nearest the line. Thorax subventrally and a dot before the spiracle on joint 5, an oblique subventral dash on joints 5 to 10 and joints 11 to 13 subventrally black. All rather obscurely marked, brown, resembling bark. During the stage the color pales to an almost whitish brown making the white linings obscure and the black dots prominent.

Stage V. Head as before, the sides and vertex pale, faintly marbled with pale luteous; width about 2 mm. Body straight, cylindrical, rather short and robust, smaller than the head; a slight dorsal elevation on joint 12 composed of the prominent tubercles i; anal plate and leg shields large. Pale wood brown, speckled with black; i. e. the tubercles and some irregular dots, besides a narrow double dorsal line, black. The line is pulverulent and fainter in the incisures. A similar, browner ventral line. Feet pale; a dark subventral shade on thorax. Setae obscure; dorsal tubercles a little prominent.

Stage VI. Head square, face flat, rounded,

slightly narrowed above; broadly, shallowly bilobed, equal in thickness above and below; clypeus high, the paraclypeal pieces reaching the vertical notch; width 2.8 mm. Color pale wood brown, face strongly mottled with dark brown around the margin; clypeus and an area on either side pale; sides faintly marbled with pale brown, most distinctly on vertex. Body cylindrical, rather robust, neck slightly narrowed; smooth, tubercles i on joint 12 produced; subventral fold slightly prominent, waved; anal shields large, rounded. Thoracic feet rather small, equal. Pale wood brown, faintly mottled with red-brown; a narrow, geminate, pulverulent, black dorsal line, slightly broadening into a shade on joints 12 and 13. Medio-ventral line pale and reddish; a broad, double, diffuse, shaded subventral black band. Tubercles and several dots in lateral region black, spiracles black ringed; feet slightly lined with black at base. Variation not marked. The lateral dots may be faint or distinct, rarely connected into a broad lateral shade, bordered above by a wavy subdorsal line and reaching over lateral region to below subventral fold. The usual form is pale brown with single dorsal and paired subventral blackish bands; tubercles i of joint 12 conically produced.

Cocoon a coarse net of brown silk between leaves. The larvae refused oak, but fed readily on persimmon and apple. Found at Brookhaven, Long Island, N. Y., eggs June 10th, mature larvae August 10th.

A NEW MELOID BEETLE PARASITIC ON ANTHOPHORA.

Leonia neomexicana, n. sp.—Length about 11 millim. Black, including legs and antennae; elytra fulvous. Form of *L. rileyi*, with a rather sparse black pubescence; mandibles stout, curved, entire, blunt at tip; antennae stout, 10-jointed, first joint campanulate, shorter and more abruptly swollen

distally than in *rileyi*; second and third joints equilateral like the following ones, not oblique with one side produced as in *rileyi*; second joint sensibly shorter than the third; third slightly longer than the fourth; fourth to ninth about equal in length, but the distal joints narrower than the proximal; terminal joint similar to the penultimate one, whereas in *rileyi* the last two joints are dissimilar. Prothorax as in *rileyi*, shining, sparsely punctured; elytra about as in *rileyi*; covering at the sides about two-thirds of the first abdominal segment. Hind margins of abdominal segments narrowly testaceous; surface of segments shining, with broad shallow punctures. At the sides the ventral segments encroach upon the dorsal area, the dorso-ventral sutures being marked by deep sub-lateral channels. Legs as in *rileyi*; claws simple, with a strong basal bristle.

Hab.—Mesilla, New Mexico, about the first of August, 1896, on a wall in which were many nests of *Anthophora vallonum* (Ckll.). This was sent at the time of its discovery to Dr. Horn, and it is much to be regretted that he did not live to publish an account of it. When recently in Philadelphia, I found it in Dr. Horn's collection, and was able to draw up the above description. *L. neomexicana* is very distinct from *Hornia minutipennis*, and quite sufficiently so from *Leonia rileyi*, as the following table of the North American Sitarini shows:—

Antennae 11-jointed; head, thorax and legs bright ferruginous.

Hornia minutipennis Riley

Antennae 10-jointed.

Black; elytra fulvous; second and third antennal joints equilateral.

Leonia neomexicana Ckll.

Dark ferruginous; elytra testaceous; second and third antennal joints conspicuously inequilateral

Leonia rileyi E. Dugès. (Mexico.)

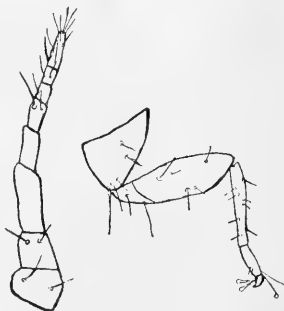
All three are parasitic in nests of *Anthophora*.

T, D, A. Cockerell.

N. M. Agr. Exp. Sta.,

A NEW PULVINARIA FROM MASSACHUSETTS.

Pulvinaria cockerelli, n. sp. ♀ Scale yellowish brown, small, nearly hemispherical in outline, slightly convex, 4 mm. long, 3½ mm. broad. Ovisac 7 mm. long, 3 mm. broad and a little more than 1 mm. in thickness. Texture soft, clear white, powdery and sticky. Eggs small oval, white, situated in an oval cluster on the under side of the leaf beneath the ovisac. Newly hatched larvae clear white. ♀ Scale cleared and mounted transparent slightly tinged with yellow. Legs, antennae, mouthparts and anal plates light yellow. Antennae 8 segmented, 3 quite long, 4 next, 7 is the shortest (see table of measurements all in micromillimeters). The hairs on the antennae are as represented in the drawing, usually 18. The length and breadth of the antennae seem to be quite constant in all of the material examined. Legs normal. Coxa broader than long, the legs usually have about 22 hairs on each (see figure of leg). Marginal spines stout, bulbous



Antenna.

Leg.

at base, tips sharp, 6 micromillimeters long, they are very easily lost in mounting.

Hab. — On the under side of the leaves of *Spiræa salicifolia*, at Methuen, Mass., and on the under side of the leaves of *Prinos verticillatus*, at Andover, Mass., 1898 (in the woods at each place). The young begin to appear about July 10 and the full grown scale with ovisac the following May. The scales become dry and drop off about the last of June, none can be found in July. When I sent this coccid to Prof. Cockerell last year, he, then being very busy, made a hasty examination of my mount and scales with ovisac. Some of the ovisacs did not have any scales, and I did not state this to him at that time. The mount showed the antennæ to be almost indetical with those of *Lichtensia viburni* Sign., and he supposed it to be a variety of that species. Being later doubtful of this, he requested me to study the insect with better material, and the result has been to prove that it cannot belong to *Lichtensia*, as it does not have the scale covered with its ovisac.

Antennal Segments.

	1	2	3	4	5	6	7	8
Length	56	44	88	60	44	28	24	52
Width	80	56	36	28	24	20	20	16
Formula	3418(25)76.							

Measurements of Leg.

	Femur with				Tarsal Claw	
	Coxa	Tro- chanter	Tibia	Tarsus	Claws	Digi- tules
Length	112	264	176	84	24	60
Width	140	92	44	28	28	36

Lawrence, Mass.

G. B. King.

JANET'S RECENT OBSERVATIONS ON ANTS, ETC.

Several recent papers* by Charles Janet,

* Note 17. Système glandulaire tégumentaire de la *Myrmica rubra*. Observations diverses sur les Fourmis. 30 pp. 9 figs. Paris, 1898.

the well known authority upon ants, wasps, and bees, deserve mention. All are written in the concise and clear style characteristic of the author.

In Note 17, nine classes of glandular organs are defined, of which the integumentary system alone comprises eight pairs: (1) Unicellular glands opening separately at the bases of the antennæ. (2) Well developed unicellular glands with a common reservoir at the base of either mandible. (3) Maxillary glands. (4) Labial glands, derived from the larval silk glands. (5) Glands of the median segment, possibly odoriferous to enable members of the same colony to recognize one another. (6) Poison glands of the female, also accessory glands, alkaline in reaction, serving — the author suggests — neither to lubricate the sting nor to complete the composition of the poison, but to neutralize superfluous formic acid remaining upon the insect itself. (7) Glands of the sheath, also represented by certain glands in the male. (8) Glands of the ninth segment.

All the integumentary glands except the poison glands secrete alkaline fluids which are believed to protect ants from the deleterious effects of their own formic acid. Thus, Janet finds that fornicaries give an alkaline reaction which varies in rapidity and strength according to the species of ant and

Note 18. Aiguillon de la *Myrmica rubra*. Appareil de fermeture de la glande à venin. 27 pp., 3 pls., 5 text figs. Paris, 1898.

Note 19. Anatomie du corselet de la *Myrmica rubra* reine. Mém. soc. zool. France, 1898. pp. 393-450, pl. 6, 25 text figs.

Extr. comptes rend. séances acad. sc. : —

No. 12. Sur une cavité du tégument servant, chez les Myrmicinae, à étaler, au contact de l'air, un produit de sécrétion. T. 126 (1898), 4 pp.

No. 13. Réaction alcaline des chambres et galeries des nids de Fourmis. Durée de la vie des Fourmis décapitées. T. 127 (1898), 4 pp.

14. Sur un organe non décrit servant à la fermeture du réservoir du venin, et sur le Mode de fonctionnement de l'aiguillon chez les Fourmis. T. 127 (1898), 4 pp.

No. 15. Sur le mécanisme du vol chez les Insectes. T. 128 (1899), 4 pp.

in correlation with the development of the acid and alkaline glands of that species.

This paper also records a number of miscellaneous observations upon the cleanliness of ants' nests, the vitality of queens, etc. and portions of the paper are republished in Nos. 12 and 13.

Note 18 is a valuable contribution to the literature upon the hymenopterous sting. The organ in *Myrmica* is thoroughly described and figured, the results of other workers being supplemented by numerous original observations. The apparatus controlling the flow from the poison gland is described for the first time in Note 18, from which No. 14 is an extract.

Note 19 is an important paper of nearly sixty pages upon the anatomy of the thoracic region which, as including the median segment, is termed *corselet*. Eight clear figures express the forms and relations of the thoracic sclerites. Only one who has undertaken a similar subject can appreciate the success with which the author has explained the positions and functions of the thoracic muscles, especially those concerned in flight. Although the paper deals chiefly with a single species in a purely descriptive way, the character and number of the illustrations, abundantly facilitate the comparison of *Myrmica* with other groups by the morphologist. Paper No. 15 is a repetition of a part of Note 19.

The amount of study represented by the interesting papers of Janet is frequently disguised by the author's conciseness of expression.

THE PANURGINE BEES.

With reference to Mr. Ashmead's article on pp. 372-376, the following remarks may be appropriate:—

(1.) *Perdita* (*Cockerellia*) *hyalina* ♂ has the hind claws simple, and the front and middle claws deeply cleft. So also *pasonis*

and other allied forms. I have examined Cresson's type of *hyalina* in Philadelphia. The ♂ of *beata*, the type of *Philoxanthus*, is unknown.

(2.) *Parandrena* Rob., has nothing to do with *Panurginus*!

(3.) *Biareolina* is ordinary *Andrena* with two submarginal cells; *Callandrena* is apparently derived from a very distinct section of *Andrena* belonging to North America (*A. pulchella* &c.). It is quite impossible to imagine that these genera have any blood-relationship, except through *Andrena*; consequently, they cannot be united.

(4.) *Hemihalictus* is I believe, an American derivative of *Halictus*, its resemblance to *Dufourea* being due to convergence. There is a marked difference in the venation, the first recurrent nervure in *Dufourea* joining the second submarginal cell at its extreme base, while in *Hemihalictus* it joins it not far from the middle. Mr. Ashmead tells me, however, that he has seen an undescribed species presenting intermediate characters.

(5.) *Hesperapis* (not *Hesperaspis*) is very distinct from *Rhophitoides* by the short dagger-like tongue, as originally described by me.

(6.) *Pseudopanurgus* is a compact and easily recognized group, belonging to the arid region; it is a matter of taste whether one calls it a genus or a subgenus of *Panurginus*.

(7.) *Nomadopsis* I can now accept, because the species on which it was founded is not the *Perdita zonalis* Cr., but a species quite distinct from any *Perdita*. I had the pleasure of seeing it recently in the Nat. Museum.

It is hardly necessary for me to say, that I value extremely Mr. Ashmead's table of bees; and disagreement as to details must not be taken for disparagement of the whole.

T. D. A. Cockerell.

N. M. Agr. Exp. Sta.

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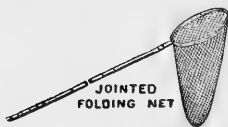
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THE SPECIES OF MYRMECOPHILA IN THE UNITED STATES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

The first species of *Myrmecophila* from the United States, two of them, were described by Bruner in 1884. An earlier, but probably mistaken reference to them was doubtfully made by Harris in 1841 (*Ins. inj. veg.*, 125), where he speaks of

"minute jumping insects, rather less than one tenth of an inch long, of a broad oval shape, and black color, without wing-covers or wings, but furnished with short thick hinder thighs. . . . It is possible they may come near to the genus *Myrmecophila*, which was unknown to me at the time [when they were seen]; and since then these minute insects have escaped my observation."

They were distinguished from *Halicta*; but as some cucumber vines were "much infested" by them, as the reference to them was expunged by Harris from the second edition of his treatise, and as no species of the genus has since been recognized in New England, it is probable that these creatures had nothing to do with *Myrmecophila*. Fitch (*Rep. ins. N. Y.*, vi-ix, 186) very reasonably thinks they may have been a species of *Podura*, but if so, the "thick hinder thighs" were a mistake of observation.

Since 1884^{*} Bruner has recognized, named and distributed, but not described, two other species of the genus, and previously Saussure had described a species from South America (Colombia). I give here descriptions of all these North American species, together with a fifth now first recognized, and add a table for their separation. In his first description of our *Myrmecophilæ* Bruner insists upon certain thoracic markings as a distinctive feature of *M. pergandei*. These markings occur, however, in all the species, although more noticeable in some specimens than in others; I have accordingly not mentioned them in my descriptions.

The different species are widely distributed over our country, but there are vast tracts where none are yet known to occur, although the conditions would appear wholly favorable. Two species are found on the Pacific coast west of the Sierras, one in the north, the other in the south; two others west of the Mississippi and east of the Rocky Mts., one of them having been found in Minnesota, Nebraska and northern New Mexico, the other in eastern Nebraska only; while the fifth species is confined

to the Atlantic coast from Maryland to Georgia. The interior basin between the great continental ranges, the Gulf States, and the region between the Alleghanies and the Mississippi, as well as the North Atlantic district are, so far as we yet know, uninhabited by *Myrmecophila*. Saussure draws attention to the fact that while the common European species is found throughout the south of Europe and also in Germany, and especially in Saxony, it is unknown in intervening districts, such as Switzerland, where certainly the examination of ants' nests has been carried on extensively.

It is not a little curious that so little is known of the male of *Myrmecophila*. Although two species of the genus are known in Europe and one of them is not uncommon, Brunner von Wattenwyl says the male is unknown to him, Saussure has but once seen one, and this was destroyed before he could describe the genitalia, and Fischer of Freiburg has seen the male of one species only, and in his classical work refers to it only by the words: "lam. supraanalis mihi non rite visa." It is, however, figured in Cuvier's *Règne anim.*, Disc. ed., pl. 82, fig. 2. Yet in the forty specimens from the United States I have had before me at this time

for study, sixteen of them are males, and represent all but one of the five species.

So far as I have been able to observe—the stout hind femora generally interfere with a lateral view—the species do not differ greatly from each other either in the male or the female abdominal organs. The tips of the ovipositor often appear very different in different individuals of the same species, but this is due to desiccation. As to the male organs, little can be seen except a somewhat protuberant and apically rounded haustate plate, as deep or almost as deep as broad, apically cleft—the subgenital plate; this partially or wholly conceals within its upper margins a pair of not very slender, blunt, cylindrical, incurved cerci, which do not reach the tip of the plate and are overshadowed by a minute triangular or rounded quadrate supraanal plate.

I have given under each species all that I can learn about the special association of these smallest of Orthoptera, and I am glad to acknowledge my indebtedness to Messrs. Pergande and Ashmead through Dr. Howard for determining some of the ants in whose nests they were found. Mr. Pergande's further aid is clear from the text.

Table of the North American species of Myrmecophila.

α^1 Body relatively large or of medium size, broad oval, depressed; hind femora pyriform, distinctly more arcuate below than above.

δ^1 . Body nearly twice as long as broad; front border of pronotum narrowly margined with luteous *pergandei*.

b^2 . Body about half as long again as broad, front border of pronotum of same color as disk. *formicarum*.

α^2 . Body relatively small or minute, less broad, convex; hind femora ovate, as arcuate above as below.

b^1 . Of medium size, the female at least 3 mm. long, generally* very dark castaneous in color *oregonensis*.

b^2 . Of small or minute size, the female but little if at all exceeding 2 mm. in length, light testaceous in color.

c^1 . Larger, the female exceeding 2 mm. in length, relatively broad, moderately tomentose, the segments not margined posteriorly with darker color; hind tibial spurs nearly half as long as tarsi.

. *nebrascensis*.

c^2 . Smaller, the female not exceeding 2 mm. in length, relatively slender, sparsely tomentose, the pronotum and succeeding larger segments posteriorly margined rather broadly and feebly with fuscous; hind tibial spurs much less than half as long as tarsi *nehawkae*.

Myrmecophila pergandei.

Myrmecophila pergandei Brun.!

Can. ent., xvi, 42-43, fig. 4 ab (1884);
Riley, Stand. nat. hist., ii, 181 (1884);
Brun., Publ. Nebr. acad. sc., iii, 33
(1893).*

Of large size for this genus, broad oval, about twice as long as broad, depressed, especially behind the prothorax, very sparsely tomentose, testaceo-castaneous, obscurely and somewhat broadly infuscated on both front and hind margins of the pronotum and on the hind margins of the segments behind it, the extreme front margin of the pronotum luteous, the head fusco-testaceous, the antennae as long as the body, luteo-testaceous, luteous basally, the legs testaceous, more or less faintly infuscated. Pronotum truncate in front and behind, the front margin about two thirds as broad as the hind margin, the sides well rounded and

considerably deflexed; mesonotum and metanotum equal, much longer than the first or second abdominal segments, which are equal between themselves. Hind femora pyriform, their generally oval shape being slightly produced apically, distinctly more arcuate below than above, less than twice as long as broad; outer hind tibial spurs more than half as long as the tarsi. Cerci moderately slender, about as long as the hind femora; ovipositor slightly longer than that.

Length of the body, 4.25 mm.; breadth, 2.25 mm.

3 ♀. Washington, D. C. with *Formica rufa* in rotten logs, Pergande (Bruner); Same, with *Camponotus pennsylvanicus* (Bruner); Georgia, Morrison. According to Bruner it is also found in Maryland. It is also given by him in his list of Nebraska Orthoptera but probably by mistake.

* Some specimens seen, probably from immersion in alcohol, are testaceous.

With regard to the reference here, and below, to *Formica rufa*, Mr. Pergande informs me that this ant has not yet been found in North America. Prof. Bruner writes that *M. pergandei* is "found most commonly with a large yellowish red ant that lives in rotten logs," which Mr. Pergande tells me is *Camponotus mellus* Say. "I have however found this Myrmecophila," Mr. Pergande adds, "quite frequently in the nests of *Camponotus pennsylvanicus* DeG., *Camp. marginatus* Latr., *Formica subsericea* Say, *Form. integra* Nyl., *Aphaenogaster tennesseensis* Mayr, and *Crematogaster lineolata* Say."

The flatness of the body and its great size renders this species readily distinguishable from all others except the next species, from which it is separable by its slenderer form and luteous edged pronotum, as well as by its being more sparsely tomentose, by the greater length of the thoracic as compared with the abdominal segments, and by its rather longer cerci.

Myrmecophila formicarum sp. nov.

Of large or medium size, broad oval, about half as long again as broad, depressed, especially behind the pronotum, sparsely tomentose, nearly uniform testaceo-castaneous, the head and hinder part of abdomen a little infuscated, the antennae fully as long as the body, luteo-testaceous, luteous basally, the legs luteo-testaceous. Pronotum shaped precisely as in *M. pergandei*; mesonotum and metanotum equal, slightly longer than the first and second subequal abdominal segments. Hind femora subpyriform, distinctly

more arcuate below than above, less than twice as long as broad; outer hind tibial spurs fully half as long as the hind tarsi. Cerci moderately slender, slightly inflated beyond the base, distinctly shorter than the hind femora; ovipositor considerably longer than cerci.

Length of body, ♂, 2.75 mm., ♀, 3.75 mm.; breadth, ♂, 1.8 mm., ♀, 2.75 mm.

1 ♂, 3 ♀. Sisson, Cala., Sept. 3, A. P. Morse, with *Camponotus laevigatus* Sm., as determined by Pergande; El Dorado Co., Cala., Feb. (Bruner); Placer Co., Cala., Sept. (Bruner); Coronado, Cala., Blaisdell (Bruner).

This species differs from its nearest ally, *M. pergandei*, in its stouter form and uniformly colored pronotum; from the other species by its flatter body, and from all of them but *M. oregonensis* in its considerably large size; from *M. oregonensis* it may be distinguished by its greater stoutness, lighter color and longer hind tibial spurs.

Myrmecophila oregonensis.

Myrmecophila oregonensis Brun.!
Can. ent., xvi, 43 (1884); Fletch.,
Rep. exp. farms Can., 1888, 63 (1889);
Tayl., Ott. nat., xii, 59 (1898).

Of medium or, in female, above the medium size, oval, convex, considerably less than twice as long as broad, sparsely tomentose, densely and most minutely punctate, fusco-castaneous, the head fuscous, the antennae about as long as the body, luteous or luteo-testaceous, the legs and cerci the same, the hind femora sometimes duskier. Pronotum with front and hind margins truncate, the sides well rounded, faintly tumid and

strongly and roundly deflexed, narrowing anteriorly so as to be scarcely two thirds as broad in front as behind; mesonotum and metanotum equal and distinctly broader than the subequal first and second abdominal segments. Hind femora ovate, similarly arcuate above and below, about twice as long as broad; outer hind tibial spurs much less than half as long as the tarsi. Cerci moderately stout, hardly tapering except in apical half, distinctly shorter than the hind femora; ovipositor considerably longer than the cerci and fully as long as the hind femora, luteous, apically dark castaneous.

Length of body, ♂, 3.25 mm., ♀, 3.65 mm.; breadth, ♂, 1.8 mm., ♀, 2 mm.

9 ♂, 8 ♀, besides immature specimens. British Columbia, G. W. Taylor (Bruner); Divide (Cottage Grove) Or., Sept. 12, A. P. Morse; Siskiyou, Or., Sept. 5, A. P. Morse, with *Formica neorufibarbis* Em., as determined by Pergande; Portland, Or., June 19 S. Henshaw, under a stone with ants (Mus. Comp. Zool.). It is reported from Victoria, Vancouver's Island, by Fletcher and Taylor. Dr. Fletcher informs me that it is "common in British Columbia under almost every slab of wood in some places, whether there are ants there or not."

This species is smaller than the two preceding and especially than *M. pergandei*; from both it further differs by its more convex body and from *M. formicarum* by its slenderer form, darker color (though some specimens seen are quite as light, but probably from immersion in alcohol) and shorter hind tibial spurs; from the next species it differs in the points mentioned under

that species and from *M. nehawkae* by its much greater size.

Myrmecophila nebrascensis.

Myrmecophila nebrascensis Brun. 1, Publ. Nebr. acad. sc., iii, 33 (1893)—undescribed; Lugg., Orth. Minn., 260, fig. 169 (1898)—undescribed.

Of medium size, oval, convex, about half as long again as broad, moderately tomentose, testaceous, sometimes feebly infuscated (in which case the disk of the pronotum is clear), the antennae rather longer than the body, uniform testaceous, occasionally feebly dusker, the cerci the same, the legs pale testaceous. Pronotum with front and hind margins truncate, narrowing so as to be nearly three fourths as broad in front as behind, the sides rounded but not full, strongly and roundly deflexed; mesonotum and metanotum equal and somewhat but not greatly longer than the subequal first and second abdominal segments. Hind femora ovate, similarly arcuate above and below, much less than twice as long as broad; outer hind tibial spurs nearly half as long as tarsi. Cerci rather small, not very slender, tapering only in apical half, very much shorter than the hind femora; ovipositor small, scarcely longer than cerci.

Length of body, ♂, 2.25 mm., ♀, 2.5 mm.; breadth, ♂, 1.5 mm., ♀, 1.65 mm.

4 ♂, 7 ♀. West Point, Nebr., May 6 in ants' nests—*Formica ruf* (Bruner); Santa Fé, New Mex., under a stone, T. D. A. Cockerell, with *Formica exsectoides* Forel, as determined by Ashmead, Aug. Luggers figures it from Minnesota.

As noted above, Mr. Pergande states that *Formica rufa* is not known in

North America. Professor Bruner describes the species so named by him as "the large red ant that builds mounds of sticks, so common throughout a large portion of the northern United States." On asking Mr. Pergande, what this species might be, he replies: "What the particular species is with which *M. nebrascensis* is associated, I am unable to say, though I incline to the belief that it equally frequents the colonies of *Formica puberula* Em., *Form. integroides* Em., *Form. rubiginosa* Em., and possibly other forms belonging to the great Rufa group."

This species is easily separated by its size from *M. pergandei* on one side, and *M. nehawkae* on the other; from *M. formicarum* it differs by its more convex body and also by its smaller size; and from *M. oregonensis*, to which it is most closely related, by its smaller size, lighter color, anteriorly broader pronotum, the more equal breadth of the posterior thoracic and anterior abdominal segments, its relatively broader hind femora, longer hind tibial spurs and shorter ovipositor.

Myrmecophila nehawkae sp. nov.

Myrmecophila nehawkae Brun.!
MS.

Of minute size, long oval, convex, much more than half as long again as broad, sparsely tomentose, dull testaceous, the pronotum and succeeding segments posteriorly margined rather broadly and feebly with fuscous, the former also narrowly edged with dull luteous in front; head more or less infuscated; antennae scarcely so long as the body, luteous or luteo-testaceous, as are also, but sometimes more pallid, the cerci and legs. Pronotum shaped as in *M. nebrascensis*; mesonotum and metanotum equal and scarcely longer than the subequal first and second abdominal segments. Hind femora ovate, at least as arcuate above as below, not more than half as long again as broad; outer hind tibial spurs much less than half as long as tarsi. Cerci short, rather stout, tapering from a little beyond the base, much shorter than the hind femora; ovipositor fully as long as the hind femora.

Length of body, ♂, 1.75 mm., ♀, 2 mm.; breath, ♂, 1.1 mm., ♀, 1.5 mm.

2♂, 3♀. Weeping Water, Nebr., L. Bruner, with *Crematogaster lineolata* Say, as determined by Pergande.

This species differs from all the others by its minute size, being as far as I know the smallest species living, with the exception of that found in S. America. From its nearest ally, the next preceding species, from which it differs also least in size, it is separable by the points brought out in the table.

PERSONAL NOTES.—Dr. J. W. Folsom has left Cambridge for Yellow Springs, Ohio, where he has accepted the chair of natural history at Antioch College. A portion of his recent studies on the Thysanura—the anatomy and physiology of the mouthparts of *Orchesella*—has recently been pub-

lished by the Cambridge Museum of Comparative Zoology.

Dr. A. G. Mayer, the president of the Club, has gone again to the Pacific Islands with Dr. Alexander Agassiz in the U. S. Fish Commission steamer Albatross and will be absent until early in the spring.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—VI.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Percnoptilota fluviata Hübn. This larva has been described by European authors (quoted in Packard, *Mon. Geom.*, pp. 78, 564, and by Hofmann, *Raup. gross Sch. Eur.*, p. 241), but I find no original descriptions in American literature.

Egg. Rounded elliptical, flattened above and below; one end depressed, the other a little flattened, not truncate. Surface with flattened areas, forming a many-sided polyhedron, the cell areas scarcely concave, rounded hexagonal. Shining pale greenish yellow. Size $.6 \times .4 \times .3$ mm.

Stage I. Head rounded, sordid luteous, dark; width about .3 mm. Body rather thick, smooth, of a sordid brownish, without marks, rather dark and somewhat transparent. Feet pale, setae obscure. After feeding the larvae appear green, but dark and sordid, becoming more translucent with growth, the thorax and joints to 10 only brownish. The larvae rest in a curious attitude, upright with the distal half curled in a spiral.

Stage II. Head rounded, slightly bilobed, with high clypeus; pale brown; setae short and stiff; width .4 mm. Body long and slender, cylindrical, smooth, feet of joint 4 projecting, cervical shield a little angularly elevated. All pale brown, not shining, translucent, with five narrow dark brown lines on the dorsum (dorsal, addorsal and subdorsal). Setae small, glandular tipped, pale; tubercles colorless, moderate. The food shows green and renders the dorsal lines obscure.

Stage III. Head rounded, sordid luteous, two vertical shades composed of brown dots extending up the face of each lobe; ocelli black; width about .7 mm. Body translucent, slightly yellowish, green from the food; dorsal, addorsal and subdorsal lines, narrow, wavy and broken, and traces of a stigmatal line, distinct centrally on the segments; spiracles

brown shaded and subventral spots about the tubercles, giving a superficial resemblance to broken transverse bands. Base of thoracic feet and a band on the front of the foot of joint 10 dark brown; feet pale; skin smooth, not shiny. Setae and tubercles very small and obscure.

Stage IV. Head pale brown, thickly dotted with dark brown; a diffuse white stripe on the face of each lobe widening above; apex of clypeus brown; width 1.2 mm. Body light green on the ventral half, almost without marks, only traces of longitudinal lines; dorsum darker green, with geminate dorsal, addorsal and subdorsal whitish pulverulent lines, separated, and the subdorsal edged below by brown shadings, which are distinct intersegmentally and faint in the centers of the segments, nearly absent and broken into spots at the extremities. Abdominal feet strongly lined with dark brown, especially the foot of joint 10 in front; thoracic feet pale; spiracles black ringed; setae short, black, with enlarged pale tips; tubercles whitish, small; iii before the upper corner of the spiracle, iv opposite the lower corner, v before, vi below the spiracle subventrally. The larvae still rest in a half spiral.

In the brown form the whole dorsum is heavily marked with dark brown, leaving diamond shaped intersegmental marks of pale brown with brown central dots, the lateral margin of the brown wavy. Region below spiracles pale brown, scarcely mottled. Some examples are intermediate between these two forms.

Larvae from Bellport, Long Island, N. Y. Eggs July 12th, mature larvae August 2nd and imagoes again on August 12th.

The larvae fed on *Polygonum* and another common garden weed not determined.

A COMPARISON OF THE SYSTEM-
ATIC DISTRIBUTION OF EURO-
PEAN AND NORTH AMERICAN
ORTHOPTERA.

The Davenport academy of natural sciences is printing and will shortly issue a synonymic catalogue of our Orthoptera which I have prepared. This offers the first good opportunity for a comparison of the relative representation of the subfamily groups in Europe and the United States, using Brunner's Prodrömus as a basis for the European forms. The following tables show the number of species in each subfamily and family that are represented in either country.

	U. S.	EUR.
<i>Forficulidae</i>	14	26
Ectobinae	0	17
Blattinae	19	2
Nyctiborinae	2	0
Periplanetinae	6	2
Panchlorinae	2	0
Corydinae	1	2
Oxyhalyoinae	1	0
Panesthinae	1	0
<i>Blattidae</i>	32	23
Mantinae	16	2
Vatinae	1	8
Empusinae	0	3
<i>Mantidae</i>	17	13
Bacunculinae	5	0
Anisomorphinae	4	0
Bacillinae	2	4
<i>Phasmidae</i>	11	4
Tettiginae	38	6
Mastacinae	1	0
Tryxalinae	90	59
Oedipodinae	154	32
Pyrgomorphinae	0	2
Pamphaginae	0	34
Acridiinae	241	17
<i>Acridiidae</i>	524	148
Phaneropterinae	25	55
Meconominae	0	3
Pseudophyllinae	2	0

Conocephalinae	48	6
Saginae	0	2
Locustinae	0	6
Decticinae	41	74
Callimeninae	0	4
Ephippigerinae	0	53
Hetrodinae	0	6
Gryllacrinae	1	0
Stenopelmatinae	77	5
<i>Locustidae</i>	194	214
Gryllotalpinae	14	3
Myrmecophilinae	8	6
Gryllinae	21	22
Oecanthinae	10	1
Trigonidiinae	4	1
Eneopterinae	7	0
<i>Gryllidae</i>	64	33
Grand total	856	471

These tables bring out clearly the many striking contrasts between the Orthopteran fauna of Europe and the United States. A few additions to our fauna made since the Catalogue was prepared do not affect the general results. Additions to the European fauna since Brunner's Prodrömus was published in 1882 have not been taken into account, and the comparison is in so far faulty.

Samuel H. Scudder.

REARING LARVAE IN TIN BOXES.

ALMOST twenty years ago I became disgusted with the impossibility of keeping leaves fresh enough for caterpillars, unless in water or on growing plants. Both these methods are very inconvenient, especially if one travels from one place to another two or three times in a summer. Having kept botanical specimens fresh in tins it naturally occurred to me that tin boxes would keep food plants in good condition. The doubt was if the larvae would bear being shut up in close tins.

Miss Eliot and I tried the experiment with several kinds of caterpillars, and it succeeded

perfectly. Having beheaded one or two in closing the cover of the tin, we then cut pieces of scrim a little larger than the tops of the boxes, laid a piece over each box, and shut the cover over it, thus preventing further executions, and also preventing cocoons from fastening box and cover together.

The "tin-box method" has many advantages:—the larvae are very easy to watch, and are so shut up that they cannot get out and wander over the house to the annoyance of non-entomological persons. Parasites cannot find them unless introduced on the food plant, a very unlikely occurrence. The leaves keep perfectly fresh as long as needed, if their stems have been put into water for an hour or so before they are given to the caterpillars.

Most of the larvae which go into the ground to pupate will pupate just as well on the bottom of a tin box, without any earth. In the case of *P. celsus*, *P. carolina*, *C. amyntor*, and other large larvae which exclude a large quantity of fluid, before pupation, an inch of sand in the tin gives better results, for it absorbs the fluid which otherwise tends to make the larvae decay in process of pupation.

The Smerinthids, both *Philampelus*, and the smaller sphingids pupate perfectly without earth. I have had scores of them change, each in its small tin—such as druggists sell for ointments,—as well as in larger boxes.

For travelling this method is delightful. I pack each tin as full of leaves as I can and leave space for the larvae, shut it tight, roll it in paper to prevent possibility of opening, and pack all the tins in my trunk. I have never had a larva die from such a journey, even when the leaves have been devoured before its end, and the larva must have rattled in its box.

Of course it is a deal of work to take proper care of a hundred or more tins, but the results pay well.

The danger is of over-crowding, but experience soon reduces this to a minimum.

Biscuit-tins, candy-tins, marsh-mallow tins, coffee tins, baking-powder tins, spice-tins, all have their uses for different sizes or numbers of larvae, and may almost always be obtained at a hotel or boarding-house. I have even been thanked for ridding the house-keeper of her superfluous tin boxes.

I have not reared every species of caterpillar, and there are many butterfly larvae with which I have not experience, but I have never seen any species which did not thrive in tightly closed tins.

Of course individuals die, but they would probably have died out of doors. It is rare to rear every one of a large brood, but I have done so more than once by this method.

Caroline G. Soule.

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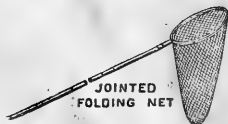
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PSYCHE.

COLOR-VARIATION IN LARVAE OF PAPILO POLYXENES, AND OTHER NOTES.

BY CAROLINE G. SOULE, BROOKLINE, MASS.

In the summer of 1899 these butterflies were remarkably abundant in Brandon, Vt., and on many occasions I followed them from plant to plant collecting the eggs as fast as they were laid, keeping those of each butterfly by themselves.

Of more than 400 eggs the greater number were laid on caraway growing by the road, a few were on wild parsnip, and more than one third were on a patch of parsley in the garden, the whole patch not larger than a man's pocket handkerchief.

As the larvae grew they showed great variety in color and marks. In the stage following the third moult some were a little blacker than others.

After the fourth moult there was almost infinite variety, from those which were almost all grass-green with only hair-lines of black and very tiny yellow dots, to those which were almost wholly black with hair-lines of green, and yellow dots either very large or almost imperceptible.

But the greatest difference was shown by thirteen larvae which were absolutely without green at any stage of larval life, and were black and white,

with yellow dots, in the last stage. The black varied much in these also, one or two specimens having only hair-lines of white.

Food made no difference in the coloring, for all the larvae were fed chiefly on caraway, and all fared alike.

The black larvae came from eggs laid by butterflies whose other eggs gave normal larvae, and they passed through the four moults in every case. I had the larvae in tin boxes on my table, and examined them at least twice daily, and each tin contained so few larvae that I was able to be perfectly sure of the moulting of each one.

The chrysalids of these black larvae were of the brown type, with no black and no green about them, but several shades of brown. They were like twenty or thirty others formed by normal larvae.

Several of the normal larvae made bright green chrysalids with rows of yellow down the back.

Although the first chrysalids were formed on August 6th, and others were formed daily for many days, only three gave the butterfly, and all of these were of the green form, and these three never

hardened, as did those which have not yet given the imago. This fact I noticed at the time, and kept watch of the chrysalids thinking that they might be going to decay.

Out of 55 chrysalids which I kept for myself only these three gave the butterfly, yet out of doors there were very many freshly emerged butterflies from August 16th until September 20th, and these butterflies oviposited as plentifully as the earlier ones, giving larvæ which pupated in October, the last one I know about pupating on October 20th. I found small leaves of caraway bearing six, nine, thirteen, and fifteen eggs each, in different stages of development, as shown by their color. One butterfly only I saw lay two eggs on the same leaf, and these two were on different divisions of the leaf, one being on the under side, the other on the up-

per side and close against another egg which had turned almost orange in color.

From watching the ovipositing I feel convinced that the butterfly does not see clearly, but depends very much on its antennæ to distinguish between such plants as tansy and caraway. Several times a butterfly would fly to the low tansy leaves growing close by the caraway, and bend its abdomen to place the egg, when it would hesitate, touch the leaf with its antennæ, and fly to another plant. If this proved caraway the egg would be laid.

The nearly full fed larvæ preferred the green seeds of the caraway to the leaves.

Of all the larvæ I reared from the egg or took from plants out of doors only one died, and that was stung by a tachinid.

PSEUDOPOMALA AND ITS ALLIES.

BY SAMUEL H. SCUDDER, CAMBRIDGE, MASS.

Pseudopomala was founded by Morse on an anomalous Acridian of New England (since found as far west as Utah) having a *Tryxaline* aspect, and which he placed in that subfamily and in this was followed by McNeill. On account of the distinct though slight pyramidal elevation on the prosternum I have since placed it in the *Mesopes*, a group otherwise confined to the Old World. It bears a close general resemblance to the oriental *Gelastorhinus*

Sauss., has a similar low prosternal spine, and an unmistakable *Tryxaline* aspect, due largely to the tricarinate pronotum and ensiform antennæ, which it shares also with *Opomala*.

My opinion of its affinities has been strengthened by finding in our country another allied genus, whose type is *Mesops cylindricus* Brun., which has a similar prosternal prominence and in which the principal distinction from *Pseudopomala* lies in the absence of

lateral carinae on the pronotum and its consequent much closer resemblance to the Leptysmae. It also possesses the rasp on the hind femora of the male, noted by Morse in *Pseudopomala*. The two genera may be separated by the following table:—

α^1 . Plane of lateral foveolae of the vertex inflexed; eyes subacuminate above, broadest below the middle; pronotum with distinct lateral carinae in both sexes; mesothoracic lobes short, well separated *Pseudopomala* Morse.

α^2 . Plane of lateral foveolae of the vertex depressed but vertical; eyes regularly elliptical, almost or quite as rounded above as below, broadest at the middle; pronotum with no lateral carinae or they are found feebly on the metazona of the male; mesothoracic lobes moderately long, attingent or subattingent *Paropomala*, gen. nov.

I have before me three species belonging to this latter type, all coming from the western half of the United States. They may be thus separated:—

α^1 . Tegmina not reaching tip of abdomen or even tip of hind femora; subgenital plate of male elongate, half as long again as the last ventral segment.

β^1 . Testaceous; antennae of female as long as the hind femora; median carina of pronotum rather coarse; mesothoracic lobes rugulose

cylindrica Brun.

β^2 . Green or pallid; antennae of female shorter than the hind femora; median carina of pronotum very delicate; mesothoracic lobes smooth

calamus sp. nov.

α^2 . Tegmina reaching tip of abdomen and surpassing hind femora; subgenital plate of male not very long, no longer than the last ventral segment

virgata sp. nov.

Mesops wyomingensis Thom. also belongs to this genus, if indeed it is to be distinguished from *P. cylindrica*. It comes from Wyoming.

The first of these three species (*Mesops cylindricus* Brun. Proc. U. S. nat. mus. xii, 48-49, 1890) I have seen only from Valentine, Nebr. (Bruner) and Fort Collins, Colo. (Baker). *Paropomala calamus* is from Lancaster, Cal., Aug. 1 (A. P. Morse); I have only seen 2 ♂, 1 ♀. It is the slenderest form of the three, of a pale green color with a slender hoary stripe running backward from the lower edge of the eye, bordering narrowly the lower edge of the pronotum. Of *Paropomala virgata* I have before me nearly a hundred specimens collected by A. P. Morse at Mesilla, N. Mex., June 29; between Gila Bend and Yuma, Ariz., July 4; and in California at Palm Springs on bunch grass, July 12, Cahon Pass, July 10, Lancaster Aug. 1, and Kern City, Aug. 4. Generally of a pale green color with a tendency to becoming cinereous above, it varies greatly from having the sides of the head, pronotum and thoracic pleura wholly green to their being chalky white on lower and dark fuscous on upper half, sharply delimited; most commonly the upper half is more or less infuscated and the lower half pale testaceous or sordid white; the anten-

nae are commonly ferruginous or ferrugineo-testaceous. Immature specimens of one or the other species were also taken in California at Colton July 17

and Los Angeles July 26. According to Mr. Morse *P. virgata* flies only a little but leaps fairly well notwithstanding its slender legs.

LIFE HISTORIES OF NORTH AMERICAN GEOMETRIDAE.—VII.

BY HARRISON G. DYAR, WASHINGTON, D. C.

Mesoleuca intermediata Guen. This larva has not been previously described.

Egg. Regularly elliptical, one end slightly truncate, but roundedly; from side view somewhat wedge-shaped, the truncate end the thicker; surface covered with flattened elongate hexagonal cell-areas, making it a many-sided polyhedron, the areas scarcely at all sunken; size .7 x .55 x .3 mm.

Stage I. Head round, whitish, eye black, mouth brown; width about .3 mm. Body slender cylindrical, colorless, transparent, food dark green. No tubercles nor shields perceptible; setae short and fine, obscure, pale. No marks, the skin slightly shining; segments slightly moniliform, joint 10 a little widened at the sides, but not marked.

Stage II. Head pale yellowish, eye black, mouth brown; width about .5 mm. Body smooth, slightly shining, transparent, all dark green from the food, tracheal line white. No marks and no perceptible tubercles or setae, which under a strong lens are fine and small, the tubercles colorless.

Stage III. Head round, about as high as joint 2, not bilobed, dull yellowish, the setae distinct, pale; ocelli black; width about .85 mm. Skin transparent, yellowish, the central part of the body light brown by transparency, till filled with food when all appears dark green. Tracheal line white; feet clear yellowish; no marks. Setae moderately long, fine, dusky; tubercles small, colorless; spiracles brown. Later there are faint, nar-

row, whitish addorsal and subdorsal lines between which a dorsal white shade appears, joining them.

Stage IV. Head rounded, the apex under joint 2, translucent luteous, a broad black band to apex of each lobe before ocelli; width 1.4 mm. Body very pale ochereous brown, marked with irregular shades of brown-black. A narrow dorsal line, edged by the whitish addorsal one; subdorsal line whitish, edged above by black; a waved, geminate lateral brown line; a few faint ventral streaks and double intersegmental spots. Dorsally a series of large patches on joints 6, 7, 8 and 9 posteriorly. The first is a spot on each side of the dorsal line behind a widening of that line; the second has these marks united into a V; the others are large patches extending between tubercles i and ii notched before and behind. A heavy lateral shading on thorax; also dorsal dots, formed by the widening of the dorsal line on the anterior edges of joints 6 to 9; a dark dot at tubercle ii of joint 10 and a heavy shade over the sides of joints 10 to 13 and on the foot of joint 10. Posterior half of the foot of joint 12 and the anal plate pale. Setae fine, pale; the venter has six obscure, whitish, longitudinal lines.

Cocoon a slight web in the ground.

Larvae from Chain Bridge, Virginia. Eggs June 30th, mature larvae July 17th and imagoes again July 30th.

Food plant. Jewel weed (*Impatiens*.)

PERSONAL NOTES.—Mr. R. E. Snodgrass, instructor in Entomology in Stanford University, has just returned from a ten months' collecting trip to the Galapagos Islands. He brings back a large collection of insects, including an especially large series of Acridiidae from all the islands of the group and a large number of Mallophaga taken from the birds of the islands. The collection belongs to the department of entomology of Stanford University, and will be studied by well-known American specialists.

Mr. W. A. Snow, son of Chancellor F. H. Snow of the University of Kansas, and an entomologist known for his systematic studies on the Diptera, was drowned in the harbor of San Francisco on October 10. Mr. Snow was swept overboard from a small launch while greeting General Funston and the 20th Kansas Volunteers just returned from Manila. Mr. Snow had been an assistant or instructor in entomology in the University of Kansas, in the University of Illinois and in Stanford University.

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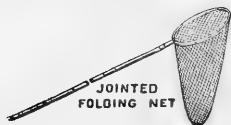
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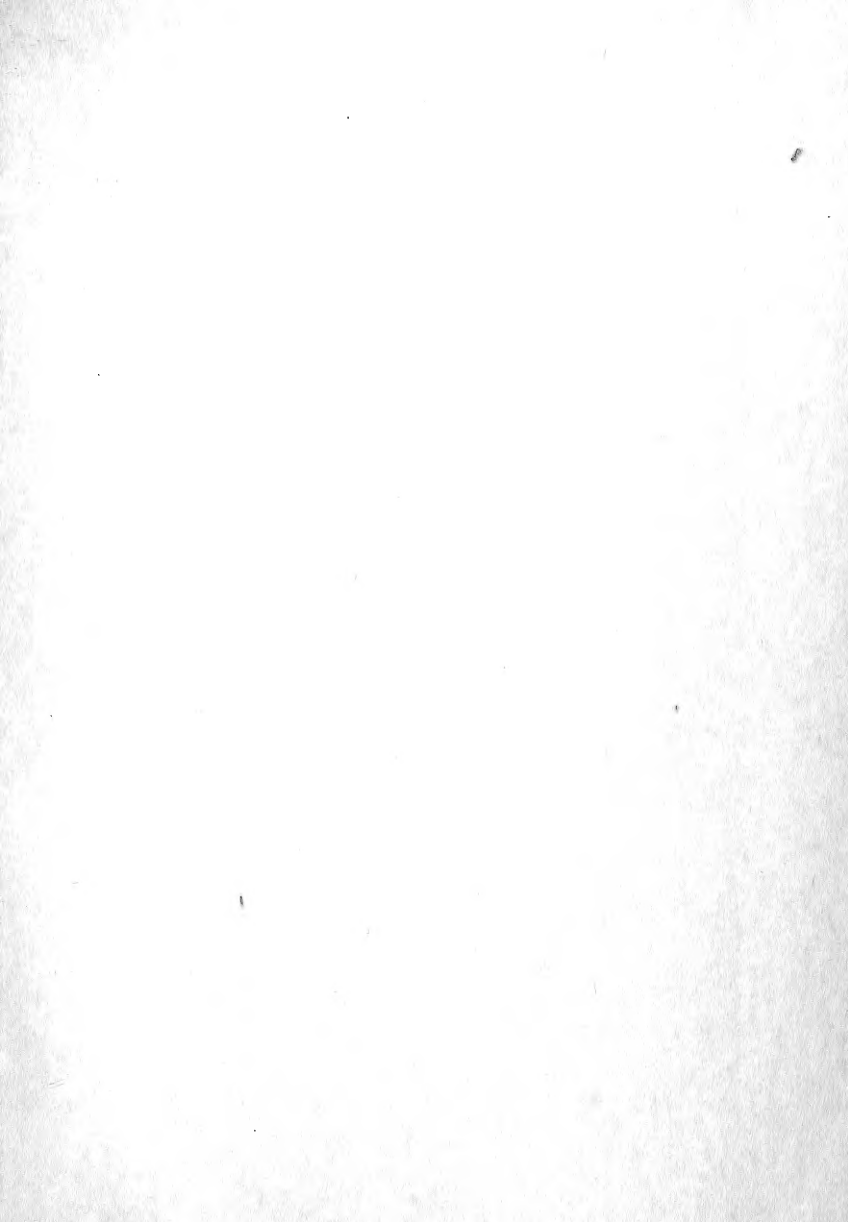
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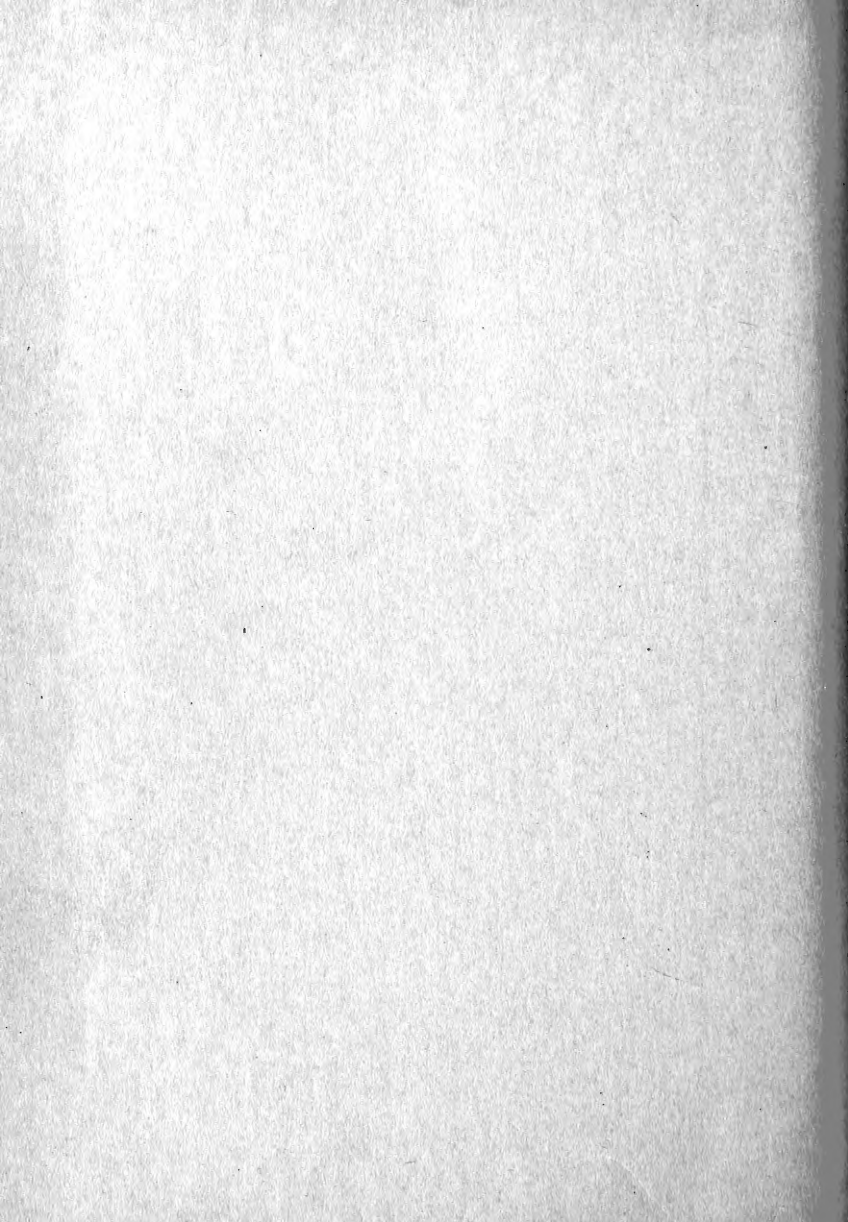
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CORRIGENDA.

- P. 55, column 2, line 12, *for* Mogosiplistus *read* Mogisoplistus.
" 131, " 2, " 3 from bottom, *for* 3 species *read* 1 species.
" 210, " 2, " 4, *for* astyanax *read* polyxenes.
" 224, " 2, last line; same correction.
" 237, line 10, *for* with well-formed *read* with no well-formed.
" 414, column 2, line 26, *for* Oedema *read* Oedemera.
" 430, " 1, " 9 from bottom, *for* 59 *read* 57.
" " 2, last line of figures, *for* 471 *read* 461.





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